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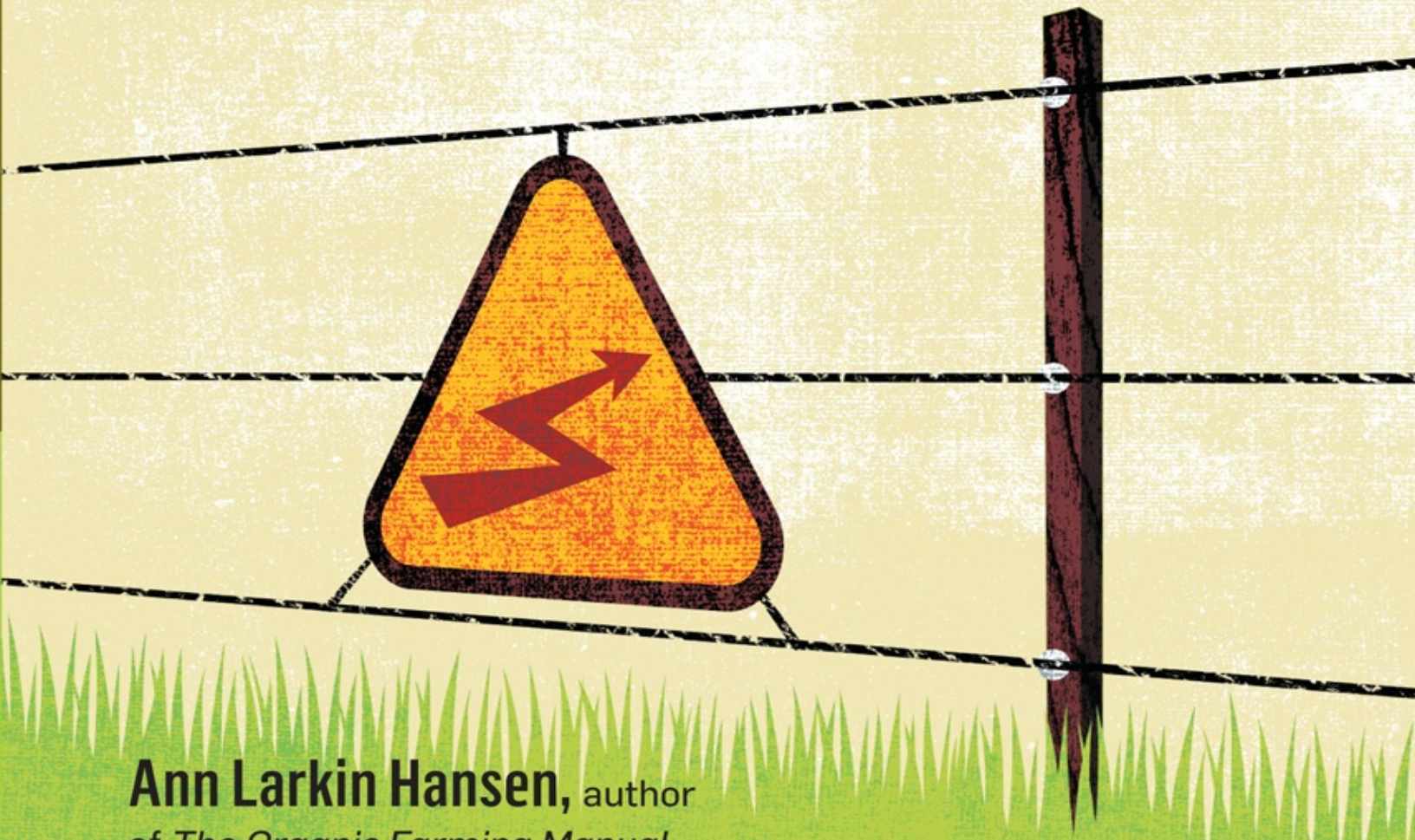
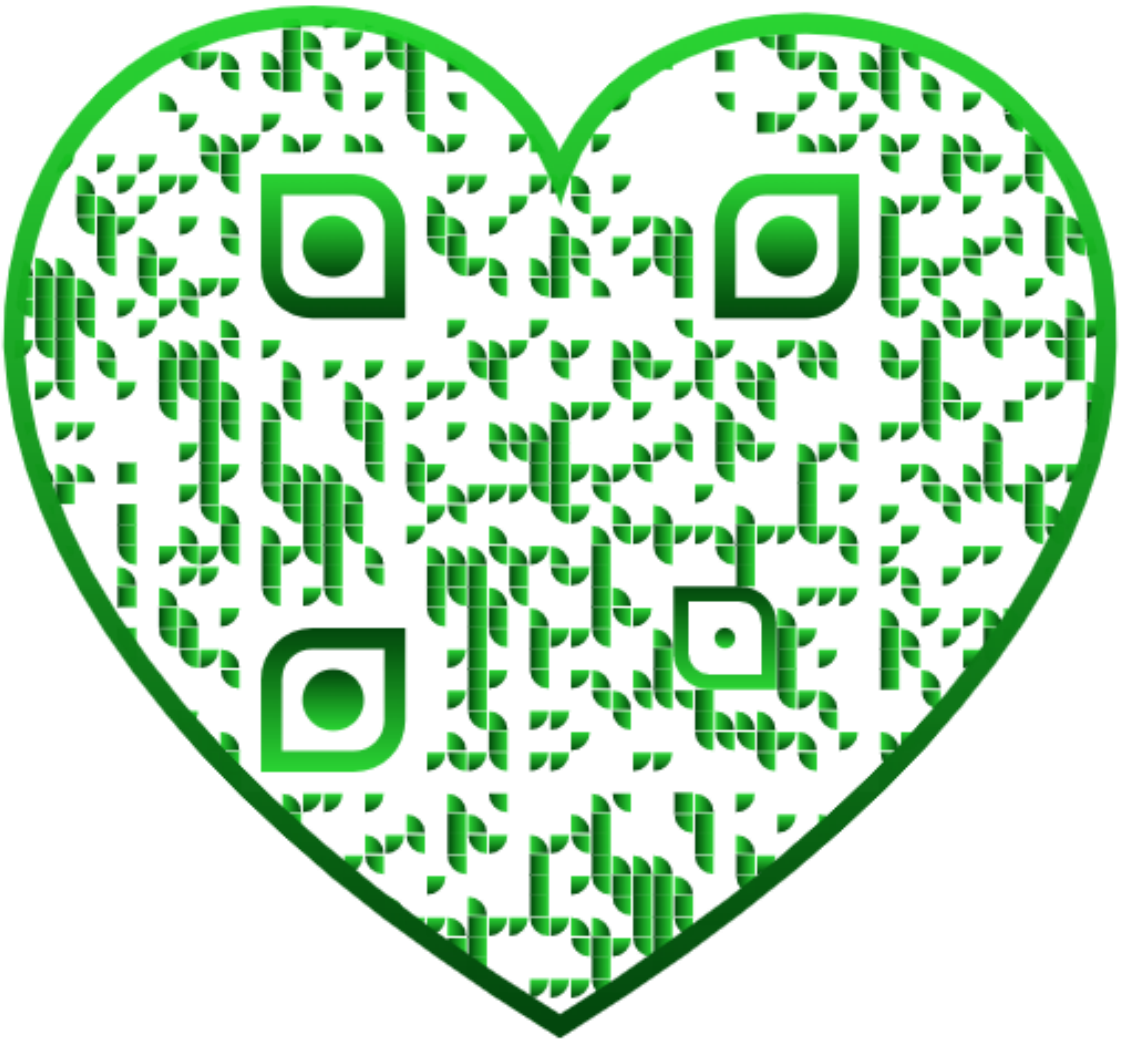
ELECTRIC FENCING

How to Choose, Build, and Maintain the Best Fence for Your Plants and Animals



Ann Larkin Hansen, author
of *The Organic Farming Manual*



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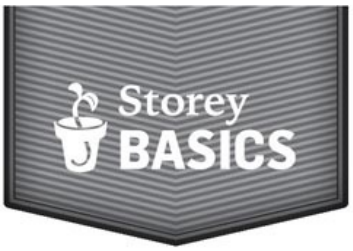

ELECTRIC FENCING

How to Choose, Build, and Maintain the Best Fence for Your Plants and Animals

Ann Larkin Hansen

Storey Publishing

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ACKNOWLEDGMENTS

Although I have used electric fencing for more than 20 years, many technical details would still elude me if not for the patient and detailed explanations given me by Byron Arnold, Product Manager with Gallagher Group Limited in New Zealand, and Gordon Shelangoski, in Product Development at Premier1. Many thanks! I'm also grateful to Lacy Weimer with Kencove Fence Supplies, who helped clarify the definitions and relationships of joules and volts, and to electrician Chad Robinson with Dairyland Power, who took the time to explain currents and impedance when he was supposed to be out deer hunting. Lastly, thanks to Deb Burns at Storey, who conceived the idea for this book and guided it through to completion.

— ALH

Introduction

The need to protect crops from hungry wildlife is as old as farming. The knowledge that moving livestock to new pastures improves their diet is as old as ranching. What's less than a century old is getting these jobs done by putting electricity on fence wires. Around 75 years ago, the tools and techniques for portable electric fencing were developed, and agriculture hasn't been the same since.

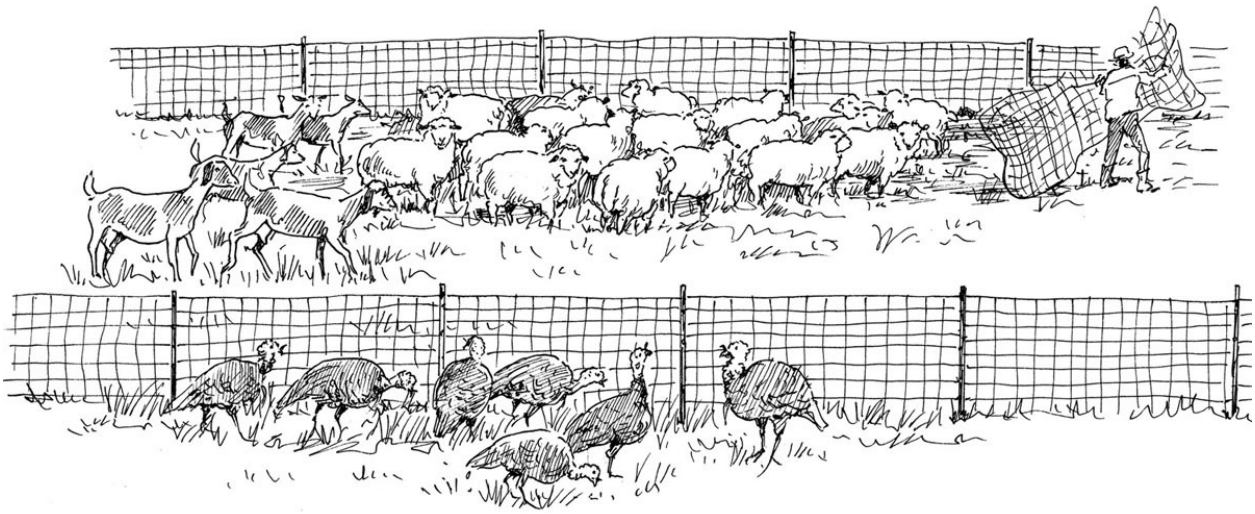
Modern electric fencing is one of the most versatile and cost-effective tools available to the sustainable farmer who needs to contain domestic animals or protect plantings, poultry, and livestock from wild animals. For a fairly small investment (as farm equipment and supplies go) you can build and use electric fence for many different purposes, such as separating deer from seedling trees, rabbits from garden lettuce, weaned calves from cows, bears from beehives, or foxes from chickens.

Where electric fence has really revolutionized sustainable agriculture is in making rotational grazing (a.k.a. management intensive grazing, or MIG) easy as well as flexible enough to adjust quickly to changing weather and seasons. Portable electric fencing used for rotational grazing will increase the carrying capacity of your pastures, improve the quality of your soils, enhance the overall ecological health of your land, and improve your farm's bottom line.

Considerations in Choosing Fencing

Which components to buy and the type of electric fence to build are determined by:

- Species and ages of animals to be controlled
- Range of soil moisture conditions
- Amount of land to be fenced, as measured in length of fence times number of wires
- Whether the fence will be permanent or temporary
- Your budget



ABOVE: *Electric net fencing is the portable fence of choice for sheep, goats, and poultry on smaller acreages.*

Why Electric?

Whether permanent or temporary, electric fencing has advantages and disadvantages compared to nonelectric, traditional fencing (see **page 4**). The most obvious difference between the two is that traditional nonelectric fencing — whether made of wood or wire — provides a physical barrier, while electric

fencing presents a psychological one. Electric fences are physically weak; the fear of electric shock is all that stops the animals.

For most farmers the advantages of an electric fence far outweigh the disadvantages. This book will cover the basics of planning, installing, and maintaining an electric fence system appropriate to what you are containing or protecting.

Pros and Cons of Electric Fences

Positives

Practicality. Electric fencing is cheaper than nonelectric, more versatile, and more effective in many situations.

Portability. Lightweight posts and plasticized wires make it quick and simple to put up and take down a temporary fence almost anywhere.

Negatives

Need for frequent inspection. When — not if — it gets shorted out by lightning, a broken wire, or some other mishap, the electric fence's effectiveness is gone and you may have animals where you don't want them.

Invisibility. You can't tell just by looking whether your fence is connected correctly to the energizer or if there is enough voltage on the wires. You can overcome this drawback by the regular use of a fence tester.

CHAPTER ONE

How an Electric Fence Works

When an animal touches a charged fence, the electricity passes through its body to the ground and back to the energizer's grounding system. This completes the electrical circuit and gives the animal a memorable shock. The shock is what makes the fence work: animals conclude that the pain isn't worth the reward of pushing through the fence. This is how they are trained.

The intermittent static electrical charges on an electric fence are generated by a fence energizer (also called a fencer, power unit, controller, or charger), a box of electronic components that convert standard low-voltage current from an electrical outlet or storage battery to the high-voltage pulses along the fence wire.

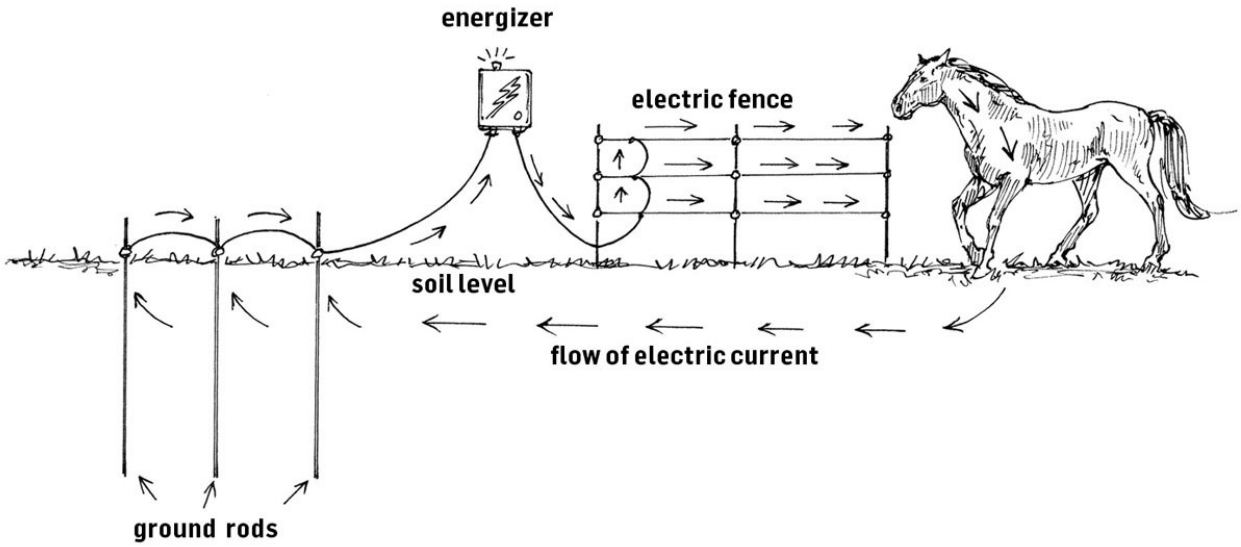
Elements of Electric Fencing

The most important principle of electric fencing is that electricity doesn't shock unless it is moving. For electricity to move there must be a complete circuit; that is, the charge generated by the energizer must be able to find its way back to the energizer.

Clearly, then, the energizer is only part of the circuit; contrary to popular belief, it alone does not control the effectiveness of an electric fence. The type and condition of the wires and whether there is enough moisture in the ground to conduct electricity both play critical roles in how effective a fence will be.

Two additional factors help to make a fence effective:

- Properly insulating the charged wires from the ground so the current flows only through the animal
- Having a good ground system, so that when the current is flowing it doesn't get diluted on its way back to the energizer



ABOVE: *The animal is the switch that completes the current in an electric fence system.*

Electric-tionary

To understand any discussion of electric fencing it's helpful to know some basic electrical concepts. The simplest way to grasp these is to compare the current along a wire to water in a hose.

Volts are the equivalent of water pressure. The more pressure (volts), the farther the charge can jump. Voltage must be higher if the charge has to jump farther to penetrate thick fur or hair.

Amps are the equivalent of water volume. The longer your fence or the more faults present, the more amps you'll need to fill the line.

Watts are **volts x amps**, and are used to describe how much electricity is being drawn from the power source. Watts also underlie the next, very important concept.

Joules are watts multiplied by time. One watt for one second = one joule. The "size" of a fence energizer is commonly ranked by the number of joules it generates. Joules are related to the amount of fence the energizer is capable of charging effectively, but the relationship is not straightforward, as we will discuss in chapter 2.

Insulation

Because you want the circuit to be completed only when an animal touches the fence, the rest of the time the wire must be insulated from the ground. This separation is accomplished by using nonconductive materials (stuff that won't conduct an electrical charge) to isolate the wire from contact with any conductive materials touching the soil.

Posts are what hold the wire off the ground. If they are made of conductive materials (such as metal T-posts), you must attach insulators between the post and the wire.

If the posts are made of nonconductive material, such as fiberglass or plastic, you can attach the wire directly to the post. You can even use metal clips to hold the wire on a fiberglass post. The clip will then be charged along with the wire, but the charge cannot get to the ground through the fiberglass, and that's all that matters.

Conductors and Nonconductors

NONCONDUCTIVE MATERIALS[1]	CONDUCTIVE MATERIALS[2]	SEMI-CONDUCTIVE MATERIALS[3]
Plastic	Metal	Wood
Porcelain (or any glass)	Moist ground	Hair, wool, hooves
Fiberglass	Water (except for distilled water)	Vegetation
	Bodies	

[1]Materials that won't conduct a charge

[2]Materials that readily conduct a charge

[3]Materials that are conductors only when moist or wet

The Grounding System

To complete the electric circuit, you must bring the electricity flow home to the energizer. You do this by creating an antenna in the soil to attract and gather the electricity flow once it reaches the ground and deliver it back to the energizer. The grounding system must be big enough, in relation to the energizer and soil moisture conditions, to be effective.

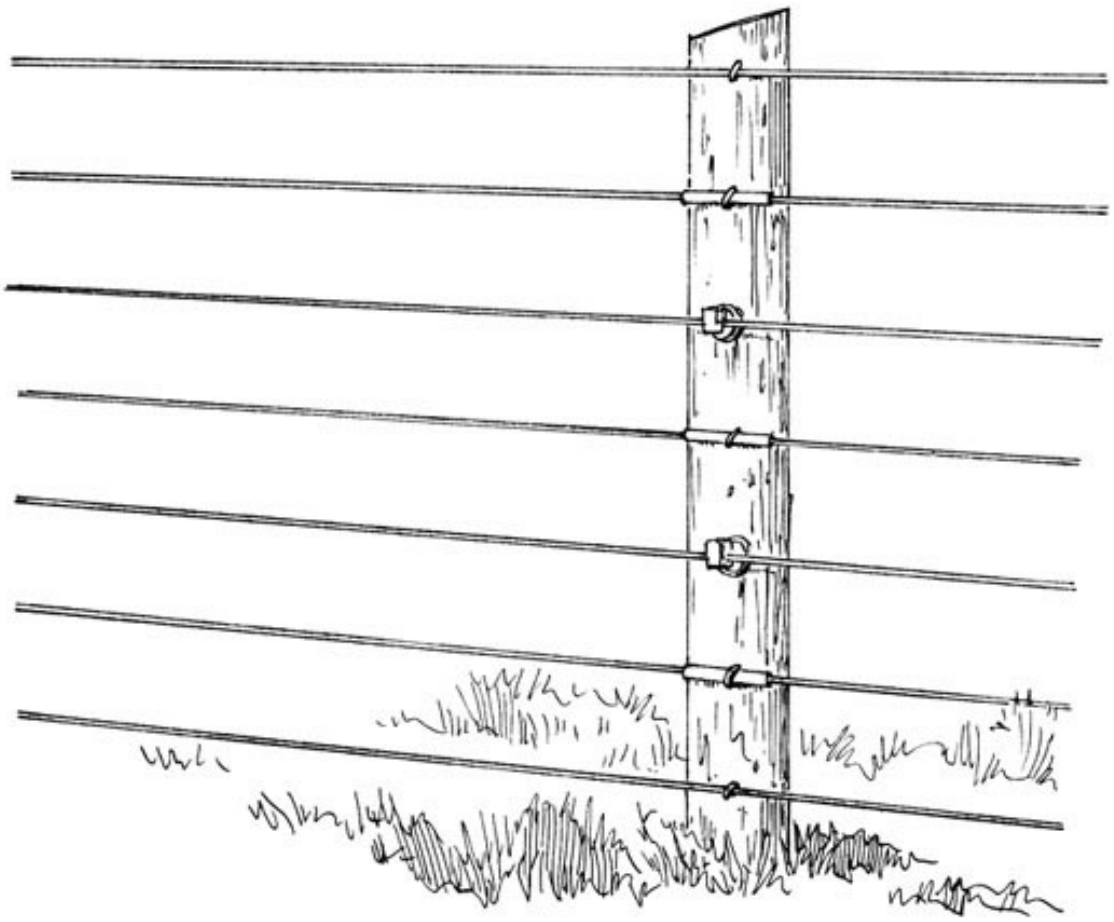
To create a ground system, you will pound a bunch of metal rods deep into the soil (see illustration on **page 6**), wire their tops together with insulated wire and clamps, and attach the end of the wire to the negative (ground/earth) terminal of the energizer. If there aren't enough feet of correctly spaced rods for the size of the charge sent out by the energizer, and the amount of moisture in the soil, the electric current can't find its way home easily and may flow weakly, impairing your fence.

Sometimes ground rods aren't enough to bring the charge back to the energizer, such as when soils are frozen or very dry. In that case you must add a "dead" or grounded wire next to the "live" or charged wires on the fence, close enough that an animal will be likely to touch both a live and a dead wire at the same time. The grounded wire is so-called because it is connected to the ground via a ground rod at the end of each stretch of fence. Instead of going through the animal to the nonconductive soil surface, the charge will go through the animal to the grounded wire and so to the attached ground rod. This will take the charge deep enough underground to find moist or unfrozen earth, allowing the charge to return to the energizer's ground rods.

Types and Uses of Electric Fence

Each type of electric fence is distinct and has its own place on a farm.

Permanent Electric Fence

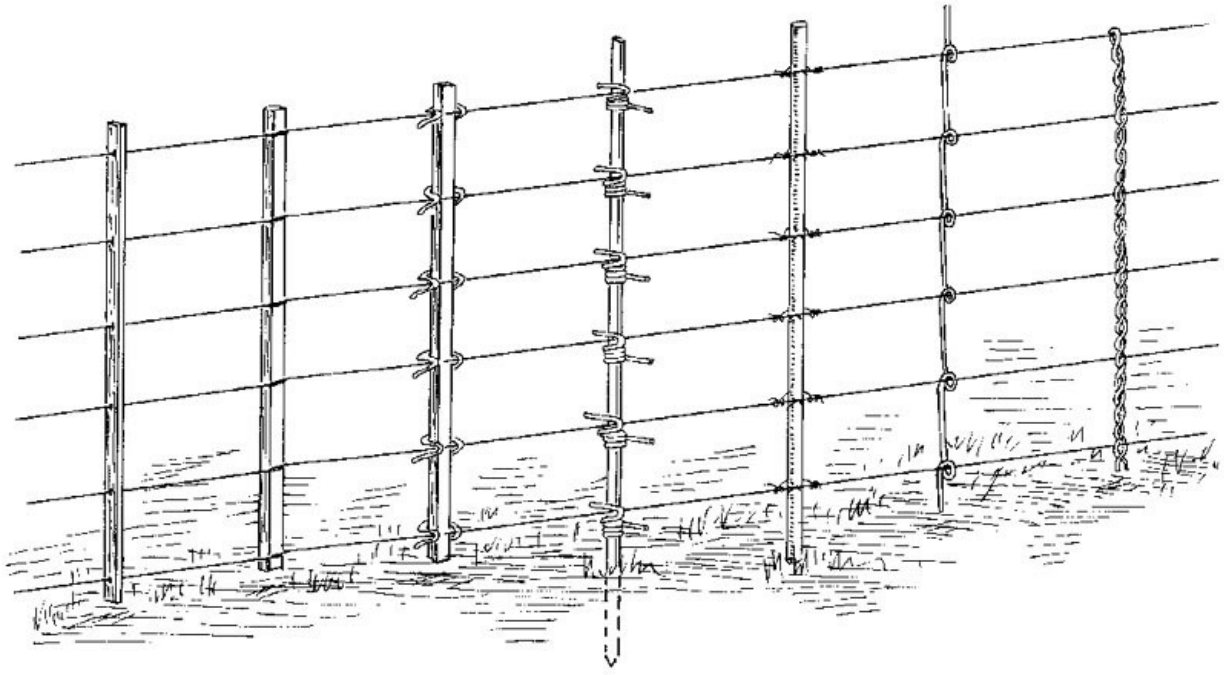


ABOVE: *Permanent Electric Fence*

Use. Best when you need to keep animals permanently away from plants, such as gardens and small fruit trees, or to create "cells" in large pastures that can then be further subdivided by temporary fencing for rotational grazing.

Setup. Utilizes deep-set metal or wooden posts and durable wires or woven wire.

Temporary Portable Electric Fence

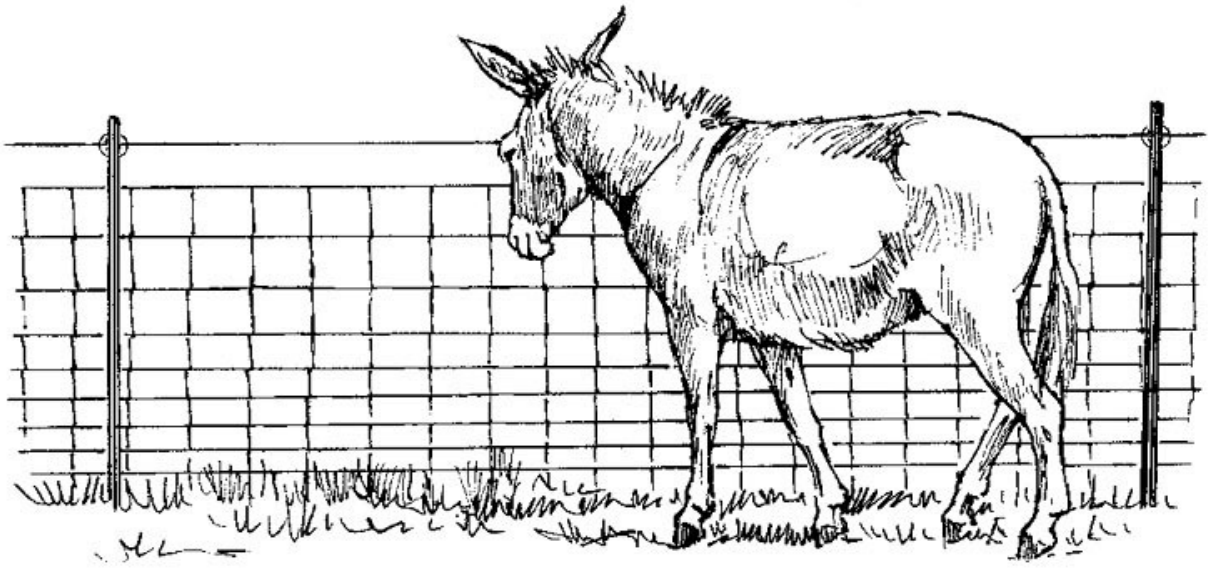


ABOVE: *Temporary Portable Electric Fence*

Use. Ideal as an effective barrier for a day, a week, or a few seasons. Works well for rotational grazing and the temporary protection of such things as gardens, young trees, and beehives.

Setup. Uses short, lightweight posts that can be quickly pushed or pounded into the ground, and light plastic netting or light plastic wire with interwoven metal filaments that is quick to reel and unreel.

Combination Fence

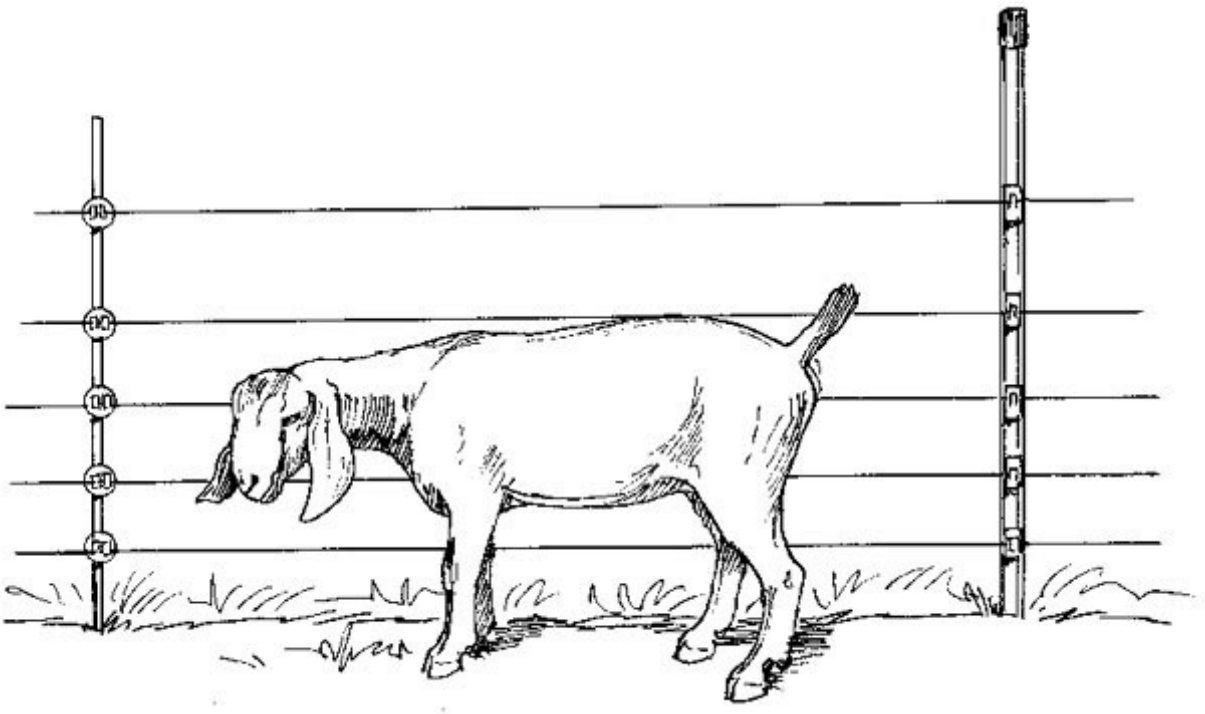


ABOVE: *Combination Fence*

Use. Combines a physical with a psychological barrier. This is the fence of choice for property lines and anywhere you want to be extra sure no animals will get through. Not only is a perimeter fence of this type effective, but it also makes it simple to hook up a temporary fence anywhere on the property. Many graziers use combination fences to create permanent "grazing cells" on a larger acreage, which then can be easily subdivided with temporary fences for rotational grazing.

Setup. Extra-long "offset" plastic insulators are used to run one or more electric wires in front of a traditional wood, woven wire, or barbwire fence.

HT Fence



ABOVE: *HT Fence*

The gold standard in the "combination" category is electric high-tensile (HT) fence, which uses extremely strong, smooth wires strung tightly on deep-set posts. Some or all of these physically strong wires can then be electrified. Although the most effective fence for any purpose, unless you're experienced, it generally requires professional installation with specialized tools and techniques. This book deals with do-it-yourself electric fencing, so HT fence won't be covered further.

Where Electric Fence Doesn't Work

There are four situations where electric-only fence is a bad idea or simply ineffective:

1. **In animal-handling facilities —** the chutes, headgates, pens, and crowding tubs used to herd and hold livestock for vaccinations, loading, pregnancy checking, and other operations that require animals to be restrained in close quarters. Crowded animals become stressed and naturally jostle each other. Adding an electrified wire to the situation, where inevitably someone will get pushed into it, can turn a quiet and controlled operation into a real rodeo. Use **only** physical barriers for handling animals in close quarters.

2. **When the farmer or rancher is often not at home** during daylight hours, or doesn't get around to checking the fenceline regularly. You can fix a short or a break before the animals take advantage of it only if you're around.

3. **If it is illegal to use electric fence along a road** or property line or across a waterway, as in some towns. Though it is legal in our rural township, I still think it is risky. Sooner or later an electric fence will fail, and then your animals may be loose on the road or in the neighbor's corn field. It would be far better to put an electric wire on the inside of a physical fence, or use just a physical fence along property lines where you need maximum reliability.

4. **When separating newly weaned youngsters** from their mothers, or breeding females from a breeding male. In fact, most physical fences are not totally reliable for this purpose either. The best approach is one or more of these:

    - A lot of distance between the two groups of livestock (difficult for small operations)
    - Isolation of the male in a very strong pen or building (traditional, but stressful for the male)

- A fence that is a physical and psychological barrier

Distance is my first choice, a dual-purpose fence my second; having both is best of all. The right combination fence can keep the bull from the heifers and the calves from the cows.

What Will Work for You?

The final decision on what type of electric fence to use where on your farm will depend on the specifics of the site, what's being protected or contained and for how long, your budget, and your personal preferences.

Use the checklist on the next page to define your parameters and goals for your fence. The answers will help determine the size of energizer and types of fence components you'll need.

FENCE PLANNING

Maximum length of fence (pace it out or estimate):

Permanent: _____

Temporary: _____

Type(s) of livestock to be grazed: _____

_____

Range of soil conditions:

Soil type (sandy, loamy, clay) _____

Does the ground usually freeze in winter? _____

Is there often snow on the ground in winter? _____

Are very dry periods common in summer? _____

Type(s) of wildlife to be controlled: _____

_____

Wild animal pressure: Low_____ Medium _____Intense _____

Hazards and terrain:

- ☐ Steep slopes
- ☐ Water crossing
- ☐ Very hard or rocky soil

Will the fence border public roads?_____

Total budget: _____

Budget per foot of fence: _____

ABOVE: *Fence Planning worksheet. Download a printable PDF* **here**.

CHAPTER TWO

The Fence Energizer

The energizer is the pulsing heart of the electric fence, not to mention the single most expensive, complicated, and confusing piece of the entire system.

The basic question everyone asks is, "What size energizer do I need to power the length of fence I have with enough of a charge to control the target animals?" Unfortunately, there is no simple formula that answers that question, since (as we discussed in the previous chapter) the energizer is only one of several variables that affect the potency of the charge.

You have to start somewhere, though, so here are two basic rules of thumb:

1. **Do the math.** Energizer size is generally given in joules (volts × amps × time), and many units also state how many miles of fence the energizer will power. As the first (and conservative) rule of thumb, figure that you'll need one joule for every 1.5 miles (2.4 km) of fence wire for easily controlled animals such as cattle and horses. For more difficult-to-control animals, including sheep and most predators, double the number of joules per mile.

   If the ratio between the joules and the miles of fence given for a particular energizer is wildly different — say, a unit claiming to power up to 25 miles (40.2 km) of fence with one joule — it's unlikely that the energizer will put enough amps as well as volts on the wire at the far end to control any animals.

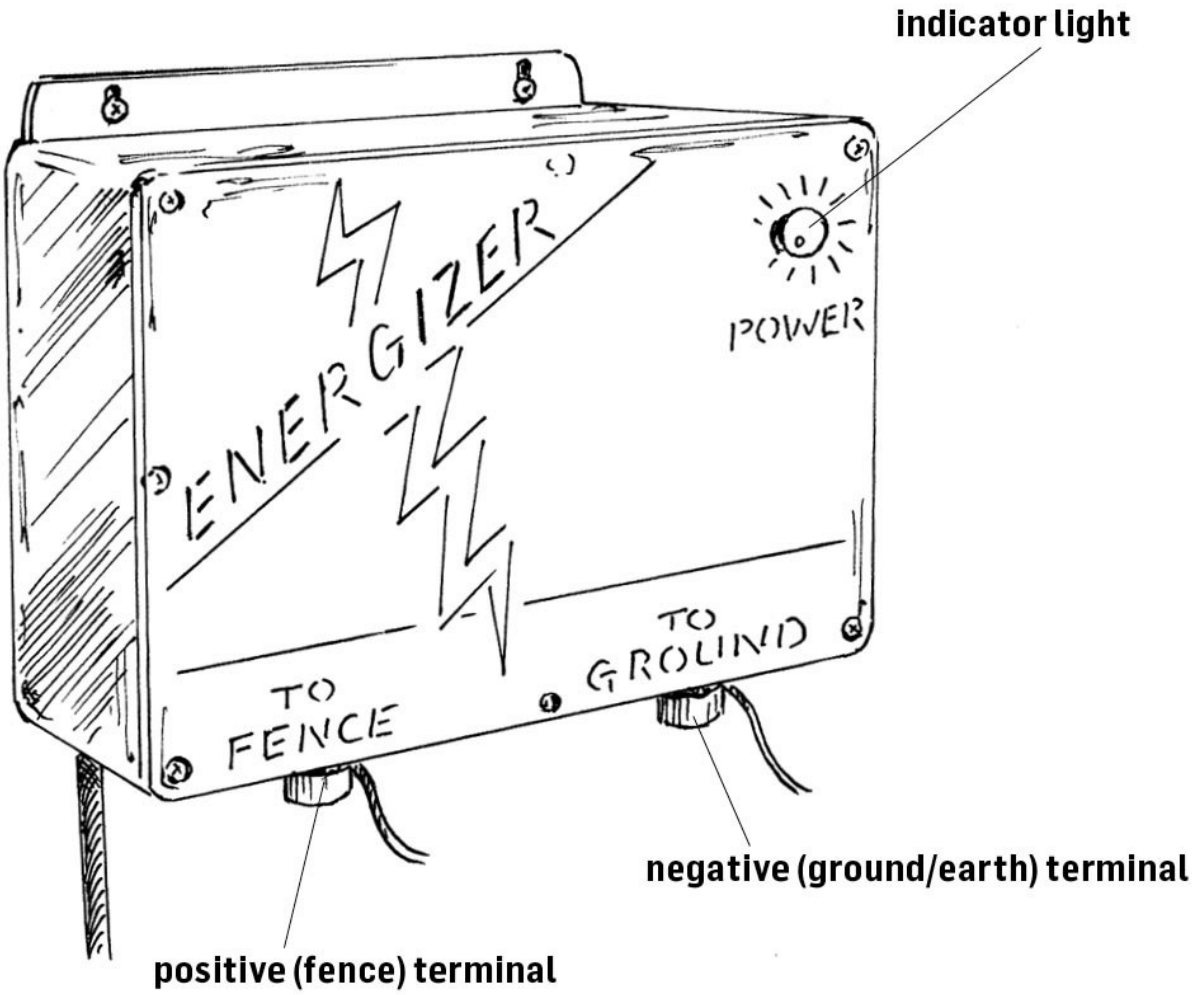
2. **It's better to have too big an energizer than too small.** If you have dry or frozen soil for all or part of the year, sandy or rocky soil, a lot of green vegetation touching the wires in some seasons, or rusty or knotted wires, you should

certainly buy a bigger energizer than what is indicated by the simple 1.5 miles per joule guideline.

Combined with the checklist answers from chapter 1 (see **page 14**), these guidelines should give you a general idea of the size of energizer you'll need. Next there are the details of energizer types, power sources, and special features to consider, discussed later (see **page 18**).

The hardest part of energizer shopping is distinguishing the good from the inadequate. There are many dozens of energizers on the market and many claims, but no universal standards, so on pages 18 through 21 we also provide a few methods for separating the wheat from the chaff.

Finally, ground rods, lightning and surge protection, run-out wire, and fence testers are essential for getting the best out of your energizer. The grounding system is as important as the energizer in getting sufficient power on the fence. These items are discussed at the end of this chapter.



ABOVE: *A fence energizer is connected to the fence wire via an insulated run-out wire from the positive (fence) terminal to the fence. A second run-out wire from the negative (ground/earth) terminal attaches to the ground rods. Most units also have an indicator light showing that the power is on.*

Sorting Out the Details

Since farmers first started electrifying fence wires, energizer research and development have centered on how to get enough of

a charge on the fence to deter animals, but not so much as to injure or kill them when they touched the wire. As energizer technology advanced, not only have the units become safer and more effective, but they now offer more choices for power sources and added features.

Energizer Types: High and Low Impedance

Early energizers, remembered as "weed burners," utilized long pulse times and increasingly large charges to push the pulse all the way to the end of the fence. The problem was that this combination of inputs tended to start fires and kill entangled animals.

To reduce the number of grass fires and electrocutions, later models added resistors, or impedance, to choke the amps and volts down to a reasonable level. These "high-impedance" energizers are safer than the old weed burners, and effective for shorter fences and livestock with thinner coats, such as cattle and horses.

The charge isn't powerful enough, however, to reach to the end of a long fence or overcome the draining effects of a lot of vegetation touching the wire. And, since high-impedance energizers still use a relatively long pulse length, there remains a risk of heat building up enough at contact points to start a fire in dry grass, or to melt the plastic in temporary wire.

Low-impedance energizers, which now dominate the market, solved the drawbacks of the high-impedance types by shortening the pulse length from tenths or thousandths of a second to ten-thousandths. At that pulse length, even the high-amp, high-voltage charge of these energizers isn't long enough to start a fire or quickly kill an entangled animal (although caught animals can still die; it just takes longer). Removing the current-choking resistance,

or impedance, also meant the charge was now powerful enough to bridge minor shorts.

Low-impedance energizers can power a charge through a lot of vegetation on the fence, keeping it effective all the way to the end of the line. These types of energizers can control almost all types of animals and power much longer fences. They also don't start fires, and have a much longer "off" time between pulses, making it easier for an entangled animal to escape.

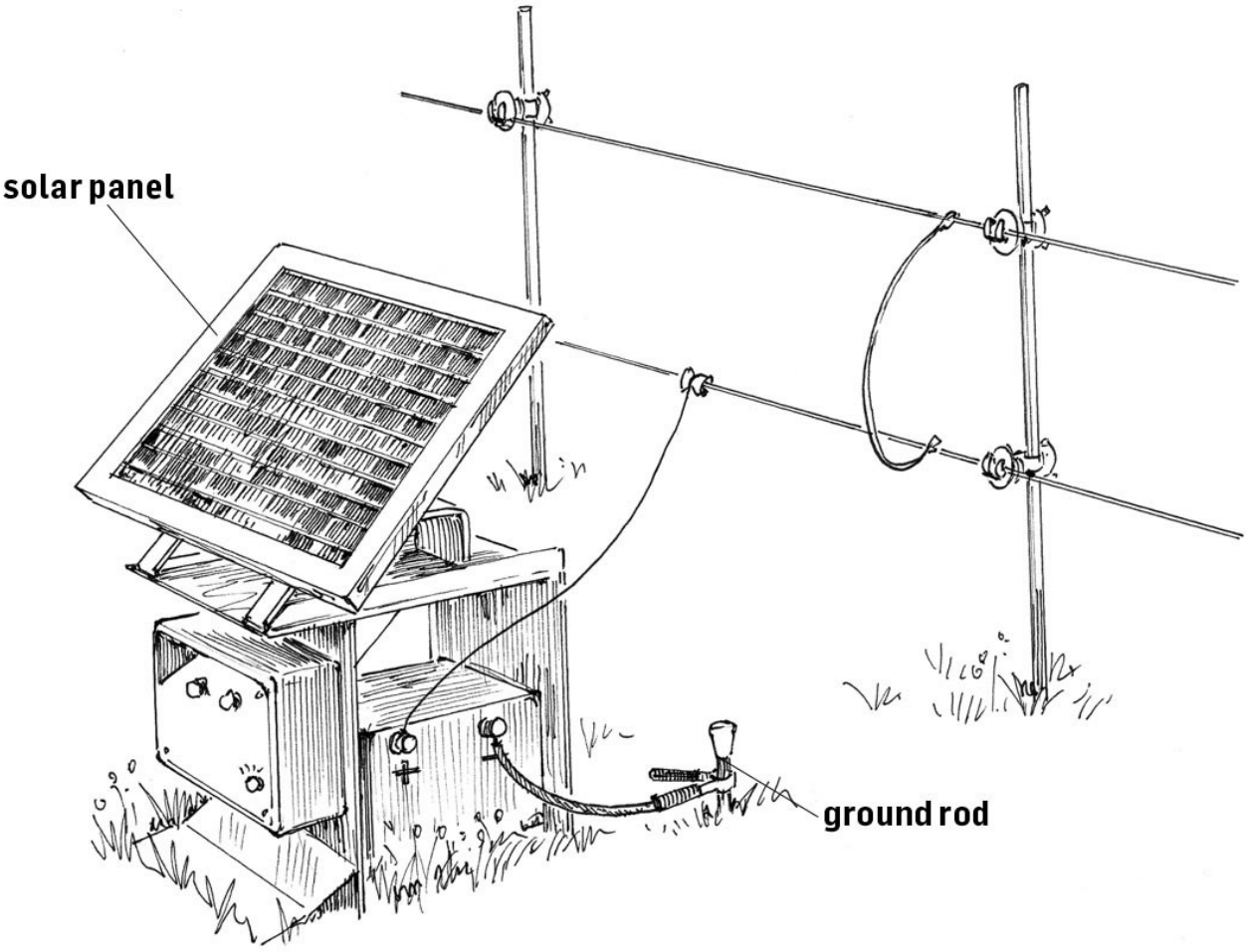
Power Sources

A fence energizer can get its power from three different sources: an electrical outlet, a battery, or a solar panel that charges a battery powering the energizer.

Plug-in energizers provide the most power for the money, require the least maintenance (basically none), and are reliable in every situation except a power outage. You must install them inside a building or where they are well-protected from the weather. Units come ready to plug in to either 110- or 220-volt outlets; unless you have a really big operation, the 110-volt types will give you all the power you need.

Battery-powered energizers are portable and excellent for locations far from outlets. They range in size from dinky little 0.1-joule units up to 12 joules or so. In general you pay more per joule of power than for plug-in units. Follow the manufacturer's recommendations for battery type and be diligent about replacing or recharging batteries as they run down.

Solar-powered energizers have the highest up-front cost for the amount of power generated, don't come in larger joule sizes, and are slightly more complicated to move and set up. But like the battery-powered units, they're portable, and the power is free as long as the sun is shining.



ABOVE: *Battery- and solar-powered energizers, like this one, are excellent for use in locations far from electrical sockets, or for flocks and herds that are traveling large distances.*

Energizers that can run off either an outlet or a battery are a good choice if you will move your fence around among some locations with electrical service and some without.

Other Energizer Variables

In addition to size and power source, consider the following when shopping for an energizer:

The number of pulses per minute. Fewer pulses per minute means longer opportunities for an animal to slip through the fence without getting a shock. Sixty pulses per minute are effective for about any purpose; thirty a minute may not control some wildlife species. Forty-five pulses per minute may be a satisfactory compromise for battery- and solar-powered units to extend battery life.

Warranties and guarantees. A good free warranty indicates that the manufacturer stands behind its products.

Repair services. When a lightning strike, power surge, or wear and tear causes an energizer to fail, it will be essential to get the unit repaired or replaced quickly. Be sure to ask what service is available.

Bells and whistles. These include power controls that allow manual adjustment for pulse length and charge size, built-in lightning protection, indicator lights, and so on. Battery-charged units may include automatic nighttime “power-saving” modes. Some of these features may be worth it for the

convenience; at a minimum an indicator light is very handy as a quick way of confirming that the energizer is on.

Telling the Good from the Not So Good

Assessing the quality of an energizer can be a little tricky, not least because a good energizer can look bad if — as is so often the case — the ground system is too small, the ground is too dry, or the fence wire is covered with rust or green vegetation. In the store or catalog, however, energizers are best compared by looking at the numbers behind the joule rating.

All Joules Aren't Equally Valuable

Recall from chapter 1 that joules = watts × time, so that one joule equals one watt for one second. Or two watts for half a second, or four watts for a quarter-second. Obviously, the longer the pulse, the lower the power, so you don't really know how powerful the charge is until you know the length of the pulse.

A good-quality low-impedance energizer should have a pulse length in the neighborhood of 3/10,000ths of a second, or 0.0003 seconds. To find the pulse rate of an energizer, read the fine print, check the catalog description, or ask the dealer. If the pulse length is the same on different energizers, the joule ratings can be more realistically compared.

Unfortunately, that still doesn't tell you the ratio between the amps and the volts. The total charge — volume and pressure — is

amps times volts.

An energizer that doesn't have a sufficient total charge will drop voltage very quickly along the fenceline (especially if there are faults or grass growth). An energizer with more true power will deliver extra amps to keep the pipe (fenceline) full even if there are minor faults. A fence full of amps has better pressure and therefore can deliver adequate voltage to give animals an effective shock.

What It Costs to Run an Energizer

A plug-in fencer is surprisingly cheap to run. To calculate the cost, find out how many watts per hour the energizer uses (read the fine print on the energizer itself, check the specs on the Internet, or ask the dealer). Multiply that number by 24 to get watts per day, and that total is multiplied by 30 to get the number of watts per month. Divide by 1,000 to get the number of kilowatts.

Next, check your monthly electric bill to find out how much you pay per **kilowatt hour** (kwh), which equals 1,000 watts for one hour. Multiply the energizer's monthly kilowatt use by the price per kilowatt hour to arrive at your cost per month.

For example, my 2.8-joule (released) energizer draws 6 watts per hour, 144 watts per day and 4,320 watts — or 4.3 kilowatts — per month. Our electric cooperative currently charges 11.5 cents per kilowatt hour, which makes my cost per month 4.3 × $0.115 = 49 cents.

Your turn:

_____ watts per hour × 24 = _____watts per day × 30 = _____ watts per month ÷ 1,000 = _____ kilowatts per month × $_____ per kwh = $_____cost per month

Instead of the joule rating, look at the "miles of fence" rating. This number will be optimistically calculated for a single, clean, larger-diameter fence wire untouched by vegetation, but it should still not be terribly different from the one to two joules for every 1.5 miles (2.4 km) of fence. If it is, you should be suspicious that even if the voltage reading is adequate there won't be enough amperage in the equation for an effective fence.

Lastly, "joules" can mean either stored joules or released joules: that is, the difference between what the energizer can generate and what it can actually put on the fence wire. Stored joules are always higher than released joules, so be sure when comparing ratings you're comparing the same type of joules.

The Rest of the Energizer System

You'll need four additional items to connect the energizer to the fence, complete the circuit, make sure it's working properly, and protect it from lightning and power surges. Of these, the most important to get right is the ground system. An energizer without a good ground system is like a tractor with no implements: lots of power, but no way to apply it.

Ground Rods

Ground rods are the essential antennae that receive the current when it flows from the fence through an animal to the soil and then has to find its way back to the energizer to complete the circuit. The better the antenna, the more current will flow and the stronger the circuit, which gives your fence its maximum shock value. The general rule of thumb is to install three feet (0.9 m) of ground rod for every joule of energizer power.

More tips to ensure your ground rods work and keep working:

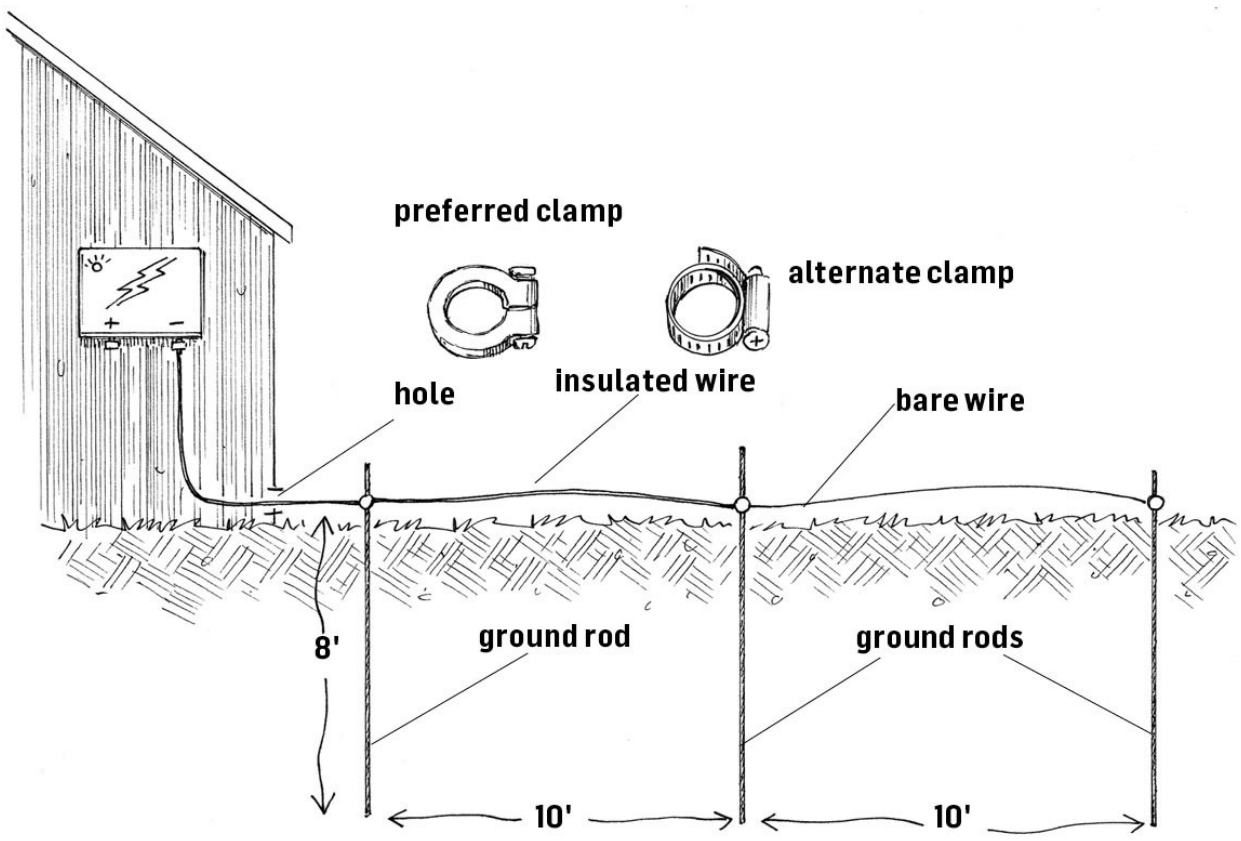
When in doubt, add more ground rods. If your soil is sandy, rocky, and/or frequently very dry or frozen for part of the year, exceed the manufacturer's instructions.

Use the right kind of rods. Copper and copper-clad steel are the best conductors, but should be used only with copper wire, clamps, and copper energizer terminals. Galvanized steel rods are much more common, also excellent, and should be used only with steel wire, clamps, and energizer terminals. All ground rods should be checked yearly for corrosion and wire brushed or sanded clean if necessary.

Install the right length. Rods should be long enough to reach moist soil, since dry soil conducts very little electricity. In areas where the ground freezes in winter, the rods should be long enough to go below the average depth of frost. Rods generally come in three-, six-, and eight-foot (0.9, 1.8, and 2.4 m) lengths; if in doubt, use the eight-footers (2.4 m).

Put them in the right location. If possible, locate the rods where the soil tends to stay moist — on the north side of buildings, in low

spots, in loamy soils. If you don't have any good places, add more rods to the system and make them longer. It's also a good idea to start the line of rods as close as possible to the energizer (certainly within 20 feet [6.1 m]), in a place where it's convenient to check the connections, and where they won't be hit by a mower.



ABOVE: *Ground rods are pounded into the soil until just a few inches protrude — enough to clamp a wire on to tie them together and run back to the energizer. Install rods within 20 feet (6.1 m) of the energizer and more than 50 feet (15.2 m) from pipes and utility grounds.*

Use the right spacing. Recommendations for rod spacing vary, but long, even spaces between rods make the best antennae. Most

sources suggest 10 feet (3 m) between 8-foot (2.4 m) rods, and 4 feet (1.2 m) between 3-foot (0.9 m) rods.

Keep the fence ground rods well away from the farm's electrical system and grounds. Place the ground rods at least 50 feet (15.2 m) from utility grounds and underground pipes and wires, and don't run the row of rods parallel to nearby electric power lines or long runs of pipe (as in a dairy barn). A charge that is on its way back to the energizer can get picked up instead by nearby pipes or wires and turn up as stray voltage in places you don't want it, such as watering tanks for your livestock.

Run-Out Wire

Here's one area where you can't substitute. The massive charge that's being pulsed out by the energizer and picked up by the ground rods is more than standard insulated wire can handle, so use only wire that's sized and insulated for electric fence use.

Lightning and Power-Surge Protection

Lightning strikes and power surges are the biggest disablers of energizers. Even though many units now come with internal protection, the $20 to $40 cost for the two external units is cheap added insurance, especially when compared to the $100 and up you spend for a good-quality energizer.

Install lightning protectors between the energizer's run-out wire and the fence wire; place surge protectors between the energizer's plug and the outlet. Neither will save your energizer from a direct lightning hit, but they still offer a lot of protection.

Many farmers keep a small, cheap energizer on hand in case the big one gets disabled. Ours hangs next to our regular energizer in the shed, ready to plug in. It provides enough power to hold the herd in a paddock if I disconnect the rest of the fence.

Fence Tester

A fence tester is essential for finding hidden shorts and tracking how changing soil moisture and vegetation on the wire is affecting the voltage. A tester with a digital read-out is more expensive, but also more informative. There is now at least one tester available that measures amps. Whichever type you buy, keep it handy and use it often.

CHAPTER THREE

Fitting the Fence to the Animal

The right voltage and the right type and number of wires on an electric fence can satisfactorily control poultry, sheep, goats, pigs, cattle, equines, rabbits, deer, fox, coyotes, and bears. The trick is to get the right voltage and type and spacing of fence wires appropriate for the species.

When it comes to electric fence there are two types of animals: those that are easy to control with lower voltages, and those that require more juice on the wire to convince them that getting through the fence is a bad idea.

The first group includes cattle and horses, which generally have thin coats and are heavy enough to make solid ground contact. The second group comprises sheep and most wild animals, which tend to have heavier, more insulating coats, are lighter on their feet, and are more determined to get through a fence. In between are species like goats and pigs, which vary in ease of control depending on how docile they are and how well trained to the fence. Poultry fencing should focus on predator control, since everything likes to eat chicken.

Wiring recommendations for type, height, and spacing are based on whether a particular kind of animal generally prefers going under, over, or through a fence, and whether it has good eyesight. Bears, for example, have poor vision and may bumble through a fence before they see it's there.

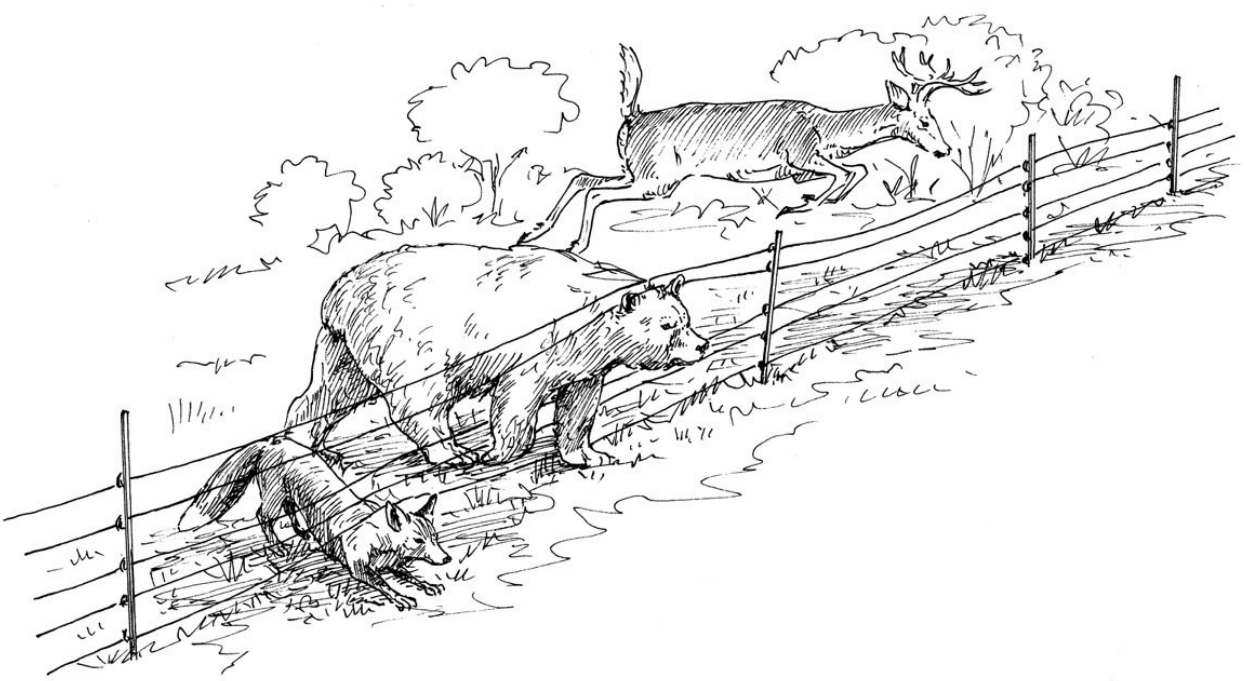
General Principles

Here are a few things to bear in mind as you plan your fence system.

No electric fence is 100 percent effective 100 percent of the time. Where it is essential to have near-total reliability, such as along property lines or separating breeding stock, it's better to build a combination physical and electric fence or a very solid physical fence.

Volts, amps, and pulse length all matter. Although the power recommendations below are given in voltage, it is also important to remember you need an energizer with sufficient power to fill your fence with amps to keep the pressure (volts) at the required level.

Find the right voltage range. Lastly, voltage recommendations vary quite a bit according to who is making them because they are based on experience and how cautious the recommender is — which varies by region and manufacturer. That said, most sources recommend a minimum of 4,000 volts for hard-to-control species, and a minimum of 2,000 volts for more docile animals. Anything greater than 8,000 volts is considered more than necessary (some sources say 6,000), and more likely to cause injury. Certainly many domestic animals will be controlled with much less than 3,000 volts; but if you're just starting out and would rather be safe than sorry, start with these numbers. Other fenceline components (insulators, leadout cables) are designed for only 10,000 volts. If you push this limit you will find you are frequently replacing these items.



ABOVE: *The wires on an electric fence must be high enough, low enough, and close enough together to prevent wild animals from jumping over, crawling under, or wriggling through.*

7 Tips on Customizing a Fence for Your Animals

Below are some general pointers for fitting a fence to an animal.

1. **Top and bottom wires should always be charged** to deter both jumpers and crawlers. If you use grounded wires, place them in the middle of the fence.
2. **The longer and thicker the hair or fur,** the higher the voltage needed for the shock to jump all the way through to the skin and be convincing.

3. **The faster the animal and/or the poorer the eyesight,** the more visible the fence should be. This is especially true for horses and bears.

4. **Taller fences for jumping animals,** tighter fences for smaller animals. The exception here are the ones for deer, which are more easily confused by a three-dimensional electric fence than stopped by a 10-foot (3 m) high fence (see box, **page 35**).

5. **Taller fences for teenaged animals.** Young animals with lots of energy are far more likely to try jumping a fence than are mature adults. If you see a lot of this sort of youthful exuberance in your herd or flock, move the top wires higher, add top wires, or purchase taller electric net fencing.

6. **Humans often don't notice or understand electric fences.** If any of your electric fence borders public roads or walking, hiking, all-terrain vehicle, or snowmobile trails, then highly visible electric tape or twine is a good idea. Post "Warning! Electric Fence!" signs for added emphasis.

7. **"Rogue" animals should be culled.** An animal that is always trying to jump over, wiggle through, or crawl under the fence, even though said critter has plenty to eat, can be a real waste of your time and energy, not to mention the wear and tear on your fence. Consider culling the animal before it teaches all the others its bad habits.

Options for Mothers and Young

Young nursing livestock will often stick a curious nose under temporary fence wires, receive a shock, bolt forward

instinctively, and then discover there is a source of pain between themselves and mom. Distress and despair ensue.

There are three possible solutions:

1. Add lower wires to contain the young stock.
2. Raise the wire so young stock can graze ahead of their mothers without getting shocked.
3. Leave the wires as they are and wait till that baby is good and hungry, and then herd it back (one or two such adventures will train most youngsters!).

All of these options work; you'll have to decide which you prefer.

Which Wires for Which Species

In this section the term wire is used to mean either all-metal wire or polywire. The latter combines lightweight plastic twine with slender metal filaments to create a much lighter-weight wire, designed primarily for temporary fences but serviceable enough for some permanent installations. Poly rope is a thicker version of polywire, and polytape looks like a ribbon. Electric net fencing (such as Electronet) is simply electrified woven wire.

The types, heights, and spacing of electric wires that are most effective for different species are discussed below, along with

some additional tips for creating an effective fence in different situations. Detailed descriptions of the various wire and post types for both temporary and electric fences will be discussed in the next two chapters.

Wild Animals and Pets

Wildlife species generally require higher voltages to penetrate their thicker coats and counteract their often greater determination to get through a fence. Pets, on the other hand (and for many small-scale and hobby farmers, the livestock are pets) can be killed if they become caught in a fence with a very high voltage. Lastly, electric fences should never be used to contain turtles, since they don't back away from a shock — they just keep trying to go forward.

General Guidelines

Most effective: Electric net fencing

Other good options: Closely spaced wires. Install alternating grounded and charged wires if the ground is dry or frozen, or if having all the wires hot proves ineffective.

Notes: Keep the grass trimmed under the fenceline to maintain maximum charge on the fence (especially the bottom wire) and maximum visibility. If you're not using electric net fencing, use polytape or poly rope for the top wire for increased visibility, or cut a white plastic bag into strips and tie these at intervals along the top wire.

Bait the wire with peanut butter or other good-smelling, sticky foods to entice animals to touch it with their sensitive noses for

maximum shock value.

Notes on Particular Species

Rabbits. Use small-mesh electric net fencing with alternating charged and grounded wires, so rabbits will make contact with at least two wires and complete a circuit. Or try a single wire three or four inches (7.6 or 10.2 cm) off the ground.

Raccoons. Two low wires at 5–6 inches (13–15 cm) and 11– 12 inches (28–30 cm) high may be as effective as electric net fencing, and are cheaper.

Woodchucks, small dogs, cats. If you are using wires, put up three at 4, 11, and 18 inches (10, 28, and 46 cm) high. Tighten the spacing and add another wire if this isn't effective.

Deer. Very hungry deer can jump over a 10-foot-high (3 m) fence, and electric net fencing is available only up to about 6 feet (1.8 m) high. If the net is not effective, you can run additional wires over the top of the netting; or instead of netting you can space wires 6 inches (15 cm) apart to get the needed height (although that's a lot of wires). You can train deer to respect an electric fence by baiting the netting with peanut butter.

3D Electric Deer Fence

For an effective, cheaper, and easier alternative to a high fence, build a three-dimensional electric fence. Deer have poor depth perception and are too confused by this fence to try jumping it.

String a single wire or polywire at nose height (30–32 inches [76–81 cm]), three feet (0.9 m) outside of a two-polywire inner fence. Set the wires above and below the height of the outer fence wire (about 20 and 48 inches [51 and 122 cm], respectively).

Canines. Electric net fencing or closely spaced wires should be effective, starting at four to six inches (10 to 15 cm) off the ground. Electric wires should be spaced six to seven inches (15 to 18 cm) apart. On a permanent nonelectric woven wire fence, add three offset electrified wires at 4, 22, and 42 inches (10, 56, and 106 cm) high. Guard dogs with the herd or flock provide a good backup.

Bears. If not using electric net fencing, use two or three strands of polytape or poly rope spaced 10 inches (25 cm) apart and starting at 10 inches (25 cm) above the ground. If you use polywire, tie on plastic strips to improve fence visibility, since bears have notoriously poor eyesight. Or the wires can be baited with slices of bacon to ensure nose contact. An offset wire on a physical fence is usually effective as well.

Livestock

Livestock are generally easier to control with an electric fence than are wild animals, though sheep and goats require more voltage than cattle and equines do. All livestock (with the exception of chickens) should be trained to respect an electric fence (see below) before being turned out to pasture. Wire heights given below are just starting points; for breeds that are taller or shorter than average, move the wires up or down accordingly.

Poultry

Most effective: Small-mesh electric net fencing

Other good options: Closely spaced wires may work for larger poultry, such as geese or turkey, if they are trained to the wire before they're fully fledged with insulating feathers.

Notes: Keeping poultry in is less of a problem than keeping predators out. If standard electric poultry netting is ineffective, try a taller size, or lock the flock in a coop at night, when predators are most active. Overhead predators — hawks and owls — will not be controlled by electric fence, or by anything except confining the flock in a closed building or under overhead netting.

Sheep and Goats

Most effective: Medium-mesh electric net fencing

Other good options: Three polywires at 10, 20, and 30 inches (25, 51, and 76 cm) above the ground, either all charged or with the middle wire grounded (some shepherds with trained flocks get by with two). Add more if you have animals that like to jump. On rangeland, five wires at 6, 13, 21, 30, and 40 inches (15, 33, 53, 76, 102 cm) are recommended.

Notes: Sheep are the hardest domestic animal to fence due to the insulation of their thick coats, so training the flock to the fence is essential (see **page 39**). Openings in the electric net fencing must be big enough for a sheep to easily pull out its head if it sticks it in.

Cattle

Most effective: Three strands of electric wire or polywire on perimeter fences at 10, 20, and 30 inches (25, 51, and 76 cm) (the middle wire can be grounded); or an offset electric wire in front of a physical fence. For internal temporary fencing use a single strand of polywire about 32 inches high (81 cm); add a second lower strand at about 20 inches (51 cm) to encourage calves to stay in.

Notes: Cattle are the easiest of livestock to control with electric fence, though if they didn't grow up with it, you should train them before turning them out into paddocks (see **page 39**).

Horses and other equines

Most effective: Three strands of polytape, or tape above two strands of polyrope. For horses the voltage doesn't need to be high, and once trained they will respect a fence. The issue is that if spooked they will run straight into it if they can't see it. To prevent injury it is critical that the fence be highly visible.

Other good options: None. High visibility is the top priority, so polytape is the recommended option.

Notes: Horses are generally easy to contain with electric fence. Match wire heights to animal size. A top wire between the height of the withers and the point of the shoulder and a bottom wire at about knee height are a good starting point.

Special Uses for Livestock Are Possible with Electric Fence

One of the best things about temporary electric fencing is how

it allows low-tech grazing solutions to solve the problem of brush and weed control in places like orchards, vineyards, and woodlots. Can't get a brush mower into the rough country under the power line? No problem! Bring in some electric netting and a herd of goats, and you're all set. Don't want to use herbicide in your vineyard? No problem! Put in electric netting and the sheep will make it look like a lawn. You can rotate geese to control garden weeds, and use cattle in the woodlot to flash-graze understory brush.

But proceed with caution. Since livestock will eat the leaves, twigs, and bark of palatable tree species, they need to be either fenced off from the trees, or moved in and out so quickly that they can't do lasting damage. Woodlots in particular suffer extensively from heavy grazing, both through direct damage to the trees and through soil compaction and loss of understory species diversity. Never turn livestock, especially cattle and pigs, into woodlands for extended periods of time.

Pigs

Most effective: A solid physical perimeter fence with an offset electric wire six to eight inches high (15 to 20 cm). For temporary paddock fencing, two wires at 8 and 16 inches (20 and 41 cm) high.

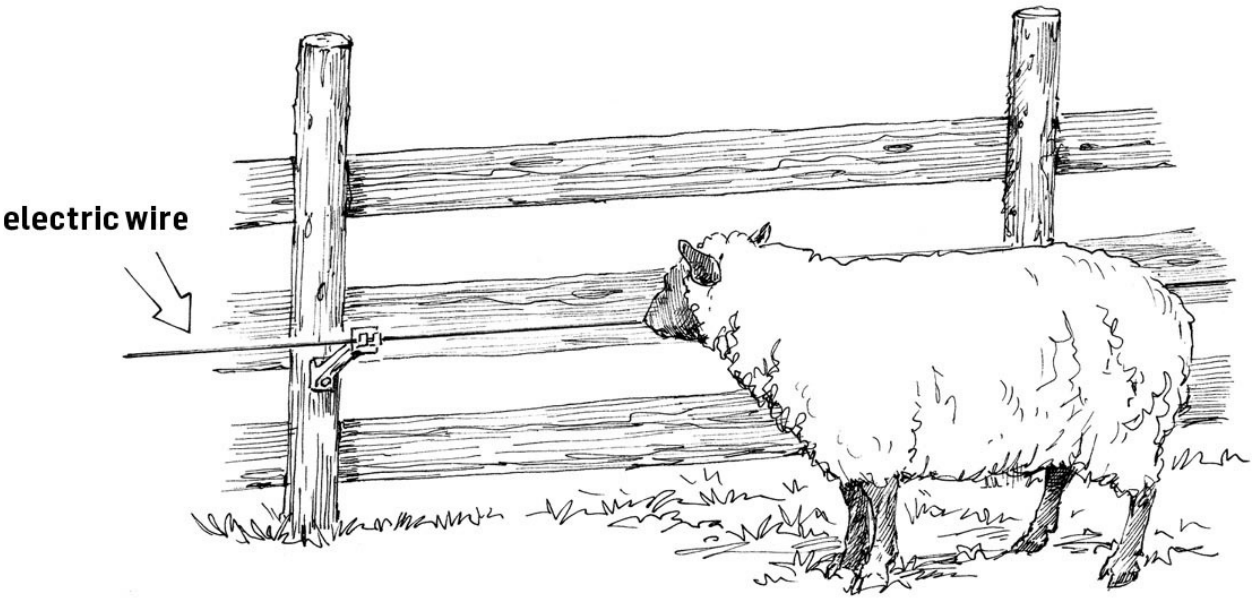
Other good options: Electric net fencing; but check it daily to make sure the pigs haven't grounded it out with dirt.

Notes: With thin coats, pigs are very sensitive to electric shocks but have poor eyesight. They also bury low wires in dirt when

rooting, shorting out the fence. Train them to the fence (see below), and check the wire daily to make sure it's dirt-free.

Training the Animal to the Fence

An electric fence is useless if an animal doesn't get a good shock from it, or jumps forward instead of back when it does get shocked. To ensure effective control, train your animals to recognize and respect electric fence by encouraging them to touch it for the first time with their very sensitive noses or ears.



ABOVE: *Train domestic livestock to respect an electric fence before turning them out to pasture. This is best accomplished by putting an offset electric wire in front of a solid physical fence in a large pen. Give the animals plenty of unstressed time to sniff the wire and learn to jump backwards when shocked.*

To do this, run an electric wire at nose height in front of a solid physical fence in a pen or corral. Calmly put the animals in the pen and leave them there for a few hours or a couple of days — whatever it takes for them all to touch the fence. When they are not stressed, domestic animals are curious about their surroundings and will explore with their noses. They will sniff the wire and receive a shock. Since they can't go forward because of the permanent fence, they learn to jump back, which is exactly what you want them to do.

Calves, lambs, and kids born on pasture will learn through experience that electric wires hurt, and because they want above all to be with their mothers, they will eventually learn to stay on the right side of the fence. If you're using polywire instead of electric net fencing for your paddocks, you may have to make a few trips out to the pasture in the first few weeks to shoo them back where they belong.

CHAPTER FOUR

Permanent Electric Fence

Permanent and temporary electric fences have in common an energizer, a grounding system (rods, clamps, and wire), run-out wire, lightning and surge protection, and fence testers, as discussed in chapter 2.

The remaining four basic components of an electric fence, the posts, wires, gates, and insulators or clips, are somewhat different for a permanent electric fence than for a temporary electric fence. Although in a pinch you can certainly substitute many temporary fence components for those of a permanent fence (and vice versa), for the sake of clarity we will separate them here into the purposes for which they were originally intended. This chapter will cover the choices available for permanent fences, and the following chapter will deal with temporary fence components.

Fencing Lesson

Here are some terms commonly used in fencing discussions and in this book.

Brace: Fences with significant tension on the wires are braced at corners and ends (such as gateposts) to keep the wire from pulling the corner post over.

Clip: Holds polywire on a temporary post. Clips can be metal if used with a nonconductive post, or plastic for use with any type of post. Plastic clips are a type of insulator (see **page 8**) specific to temporary posts. Posts may come with clips already attached or molded on, or you may have to purchase clips separately.

Corner: Where a straight run of fence meets another straight run coming from a different direction. Right-angle corners are most easily braced and most durable.

Insulator: Any nonconductive device that keeps an electric fence wire from touching a fencepost or other potentially conductive material.

Post: The vertical components of a fence, which serve to hold the horizontal wires or rails off the ground.

Rails or wires: The horizontal components of a fence, made of wood, metal, wire, polywire, or netting, which form the actual animal barrier.

Posts

A permanent fence needs posts that will stand straight and solid for many years despite soils heaved by freeze-thaw cycles, the onslaught of micro-organisms intent on causing decay, and the chemical processes that progress from rust to dust. The higher cost, weight, and installation labor of these types of posts are offset by their stability and durability.

Permanent fenceposts typically have about one-third of their length underground, so add half again as much to the height of your fence to determine the post length. For example, for a standard four-foot-high (1.2 m) fence, add an additional two feet (0.6 m) for the underground portion, equaling six-foot (1.8 m) posts.

Corner posts will be sturdier if set even deeper. In cold areas their bottoms should be below the winter frost line, to minimize the effects of frost heaving.

There are four basic types of permanent fenceposts: wood, steel, cement, and vinyl or plastic.

Wood posts are the traditional choice because they are sturdy and durable (depending on the species of wood), and, if you have trees, you can make your own. They don't bend, but they can break, and will eventually rot away at the soil line. (Depending on the tree species, the climate, and the type of chemical treatment used, if any, rotting can occur anywhere from a few years to a few decades after installation.) Wood posts require nail-on or screw-in insulators between the post and the electric wire.

Steel posts are now the most common type in most areas, since they're generally cheaper than other types and much more quickly installed. They will bend rather easily, rust away after a few decades, and require snap-on or wire-on insulators between the post and the electric wire.

Cement posts are popular in some areas where there isn't a lot of freezing and thawing (which eventually crumbles cement). In those regions they are very durable, especially if reinforced with steel rebar. Use special cement post insulators with pins between the post and the wire.

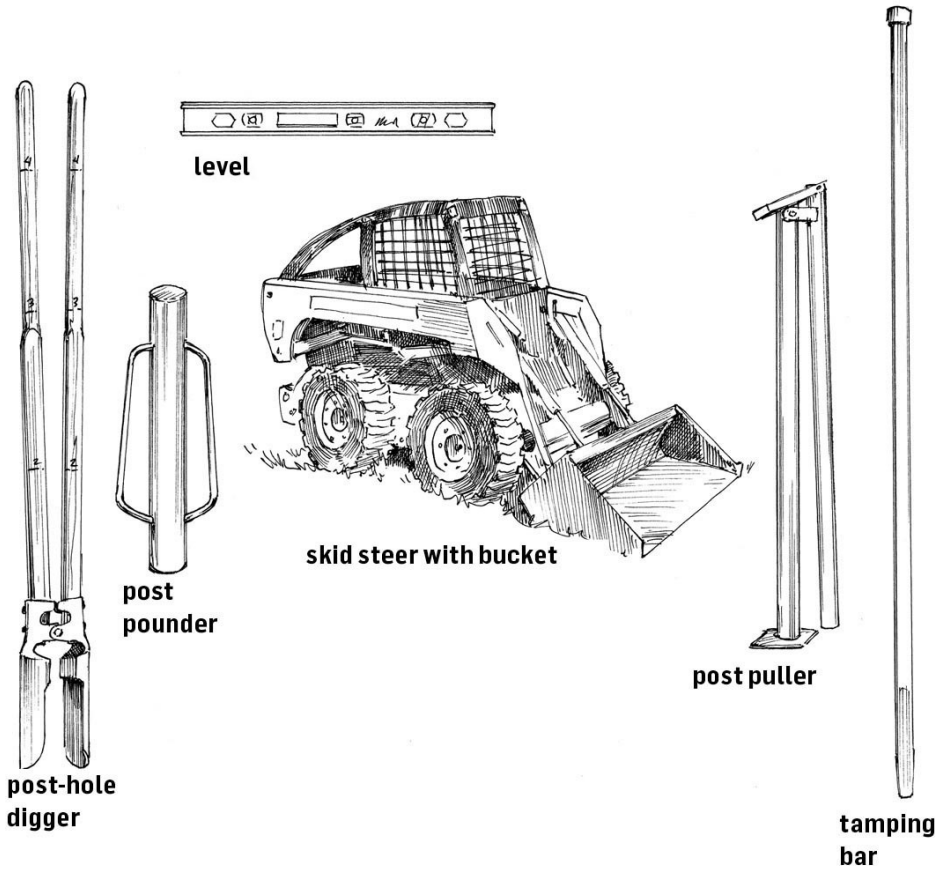
Vinyl/plastic posts are variable in quality, though generally pricey. They don't rust like steel, rot like wood, or crumble like cement, but eventually they may become brittle from weather exposure. Plastic posts don't require insulators, but you will have to nail or screw in clips to hold the wire, or drill holes through the

center of the posts (unless they're pre-drilled) and run the wire through the holes.

Installing Permanent Line Posts and Corners

Permanent fences take a lot of labor to build. Rather than regret a fence placement when you're not sure precisely where you want it, try installing a temporary fence for a season or two to see if it works for your grazing or plant-protection program.

Steel posts are pounded in manually with a post pounder or pushed in with a tractor or skid steer bucket. If the soil is soft you can pound or push in slender wood "pencil point" line posts. Larger-diameter wood posts and harder soils require first digging a hole by hand or with an auger, then inserting the post and tamping down the dirt around it to make it solid. Cement and vinyl or plastic posts also generally require first digging a hole and then tamping the post tight.



ABOVE: *Permanent post installation and removal are done by hand with post-hole diggers, post pounders, and post pullers; or mechanically with a skid steer or tractor with an auger to drill, bucket to push, and chains to pull.*

Building Corners and Ends

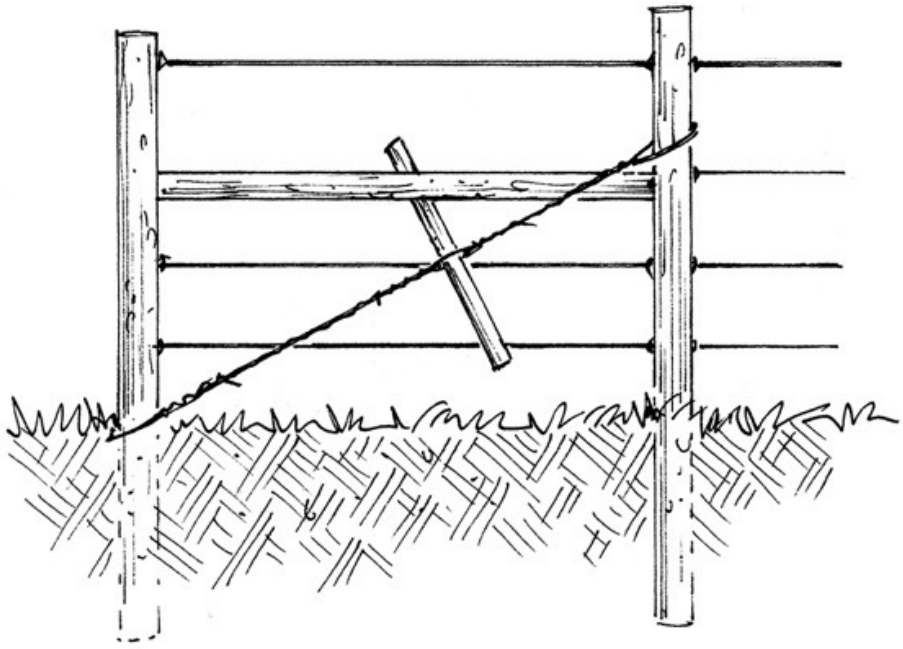
Install corners and ends first, before the line posts. Permanent fences made with only low-tensile electric wires don't usually need bracing on the corners and ends, so you can simply pound or dig in the single corner post and you're done. But combination fences utilizing woven or barbwire should be braced to prevent the necessarily taut wire from eventually pulling over the corner and end posts.

Of the three types of corner and end braces that actually work well, the floating and diagonal braces are adequate in most situations. The H-brace, however, is probably the most effective and durable overall (see illustration in box below), although it requires a little more effort to construct.

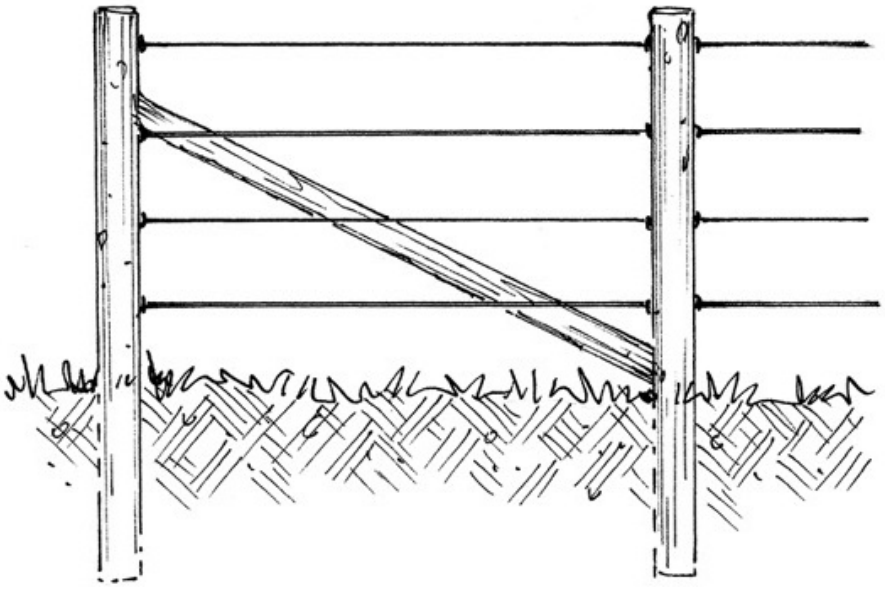
Braces built from wood posts can be nailed together; for steel posts, buy special connector hardware.

Types of Braces

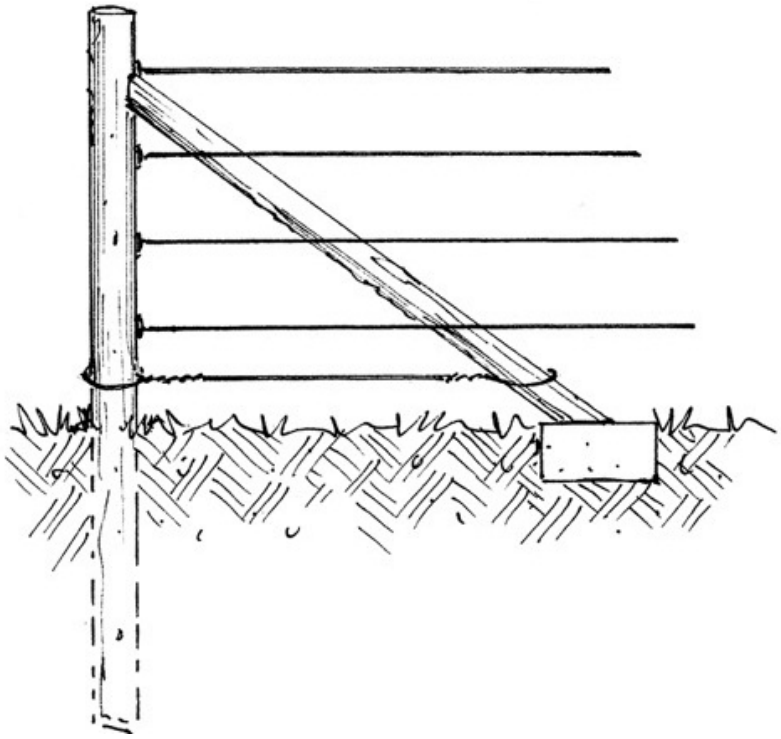
Install braces at the corners and ends of any permanent fence where the wire is pulled tight. An H-brace takes the most time and materials to build, but is the most reliable. A floating brace or a diagonal brace works well when there are fewer wires and less tension.



ABOVE: *H-brace*



ABOVE: *Floating brace*



ABOVE: *Diagonal brace*

Installing Line Posts

The line posts in traditional physical fences are typically placed 8 to 10 feet (2.4 m) apart. This spacing can vary considerably by locale, though, and may depend on whether the wire is heavy or light (posts for barbwire fences out West are often **much** farther apart). Permanent electric-only fenceposts can be spaced 20 feet (6 m) or even farther apart, the only limiting factor being how much wire sag you're willing to put up with.

The easiest way to get a straight fenceline is to put in the corner posts first, then stretch twine (baling twine works great) or wire from corner to corner, and install the posts along the wire. To measure the correct distance between the posts you can use a tape measure, a measured length of board or PVC pipe, or, if you're not very fussy (though I am), just pace it off.

Wire

Smooth (no barbs) all-metal wire is durable and conductive, and your best choice for permanent electric fences. There are four variables to consider when choosing wire:

Metal type. You can buy either aluminum or steel wire. Aluminum is more expensive but four times as conductive (so you might manage with a smaller energizer), rust-proof, lighter, and more glittery and visible. Steel is much stronger overall and has more elasticity, so it provides much more durability, especially in areas with cold winters and hot summers — which cause the wire to

expand and contract a lot. Don't connect wires of different metals together; the electricity will induce corrosion and impair the effectiveness of your fence.

Thickness, or gauge. The lower the gauge, the thicker the wire. And the thicker the wire, the more electricity it can conduct. Current moves along the outside of the wire, so bigger wires have more surface area and can move more current. Thicker wire also lasts longer and doesn't break as easily, but it's more expensive as well as harder and heavier to handle. A good compromise between ease of handling and good conductivity and visibility for permanent fences is 12.5-gauge steel wire or 9-gauge aluminum wire.

Single strand or multi-strand. Single-strand (solid) wire is cheaper than multi- and quite adequate for most permanent fences. Multi-stranded (a.k.a. stranded) wire, made of many individual metal filaments twisted together, is light and flexible, easy to reel and handle, and a good choice if you're going to use it for both temporary and permanent fences. Stranded wire is also much easier to knot when it breaks. Because the filaments create more surface area than in a solid wire of the same diameter, stranded wire is more conductive.

Wire coating. Since steel is prone to rusting, which greatly slows current flow, many steel electric wires come with a protective coating. The two common choices for coating are **galvanized** (zinc-coated) and aluminized; the latter is more expensive but lasts several times longer unless the coating is broken. The durability of galvanized wire is related to the thickness of the coating, with 1 being the thinnest and 3 the thickest of coats. You may also come

across wire coated with an aluminum-zinc alloy, a good compromise between price and durability.

Staying Safe

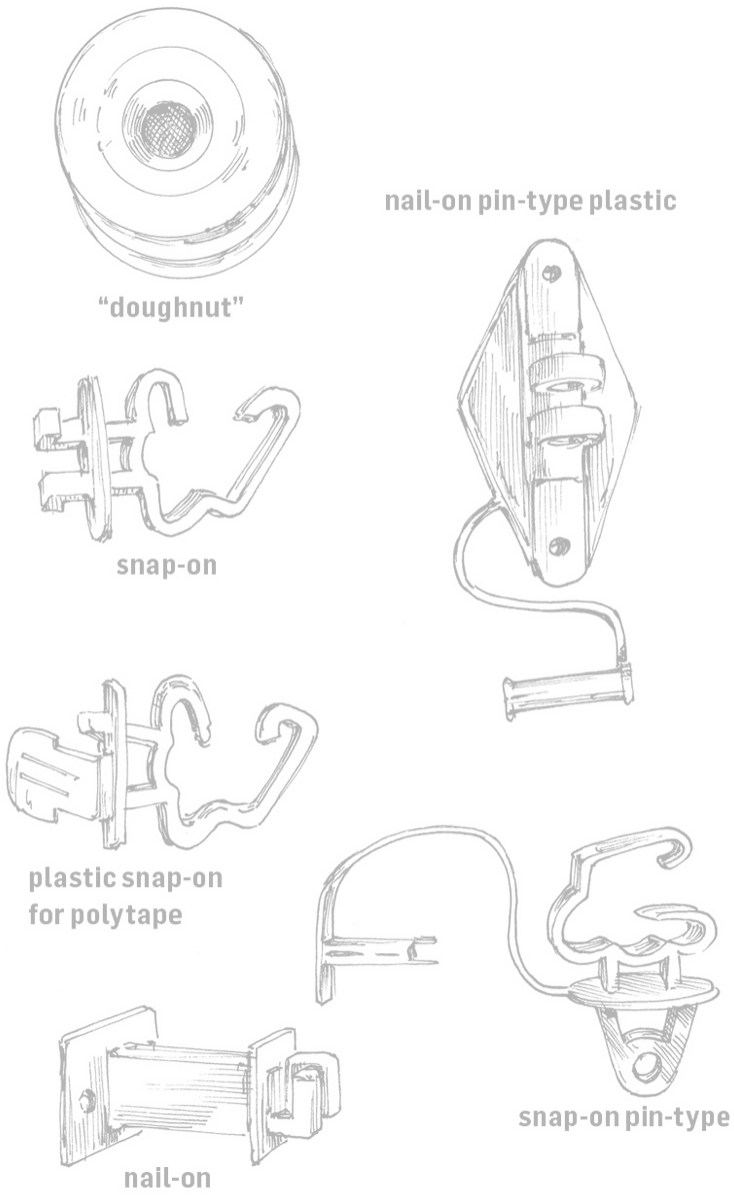
Don't even consider electrifying barbwire. Not only is it illegal in many areas, but it's actually dangerous as well. An animal caught on the barbs will be even more panicked by electrical shocks. It will continue to fight the wire, usually getting further entangled, until it is seriously injured or even dies from the continual shocking and the barbwire cuts.

Insulators

An insulator is anything that can be attached to a fencepost that will hold a wire and not conduct electricity. I've used recycled porcelain doughnut insulators from old power lines. If you're inventive you could probably make your own insulators out of something plastic. On the other hand, insulators are pretty cheap, and you can buy a bag of them for a small amount of cash.

There are three features to consider when buying insulators.

Get an insulator that attaches to the sort of posts you have. Wood posts need insulators that nail on; steel T-posts take insulators that snap on; cement posts require insulators with pins where you pre-drill the hole; and plastic or vinyl post insulators are generally nailed or screwed on.



ABOVE: *Insulators for permanent posts come in a variety of forms, including snap-ons for steel T-posts, "doughnut" styles for corner posts, and nail-ons for wood posts.*

Use the right length of insulator. The farther away an insulator can hold the electric wire from the grounded permanent fence wires, the less often a deer will wrap one around the other and short out the fence. On the other hand, longer insulators seem to break

much sooner than shorter ones do. Lengths of insulator shanks vary from one to eight inches (2.5 to 20 cm); get the shortest ones for all-electric fences, and longer ones for running offset electric wires on permanent physical fences.

For corners and ends, use insulators made specifically to handle the extra strain from wire that's pulling both to the side and straight ahead. Although these cost a little more, they pay for themselves in durability and reliability.

Gates

For permanent fences, nonelectric gates are generally made of solid materials and either purchased or built from wood, wire, and/or metal. To run electricity across a gate opening, you can bury an insulated wire across the space or run it overhead.

You can also create your own electric gates from purchased or homemade gate handles and the same wire you've used for the rest of the fence. Simply run the wire across the gate opening, and attach a handle at the far end. Connect it to the fence on the far side by hooking it into a loop made with the end of the fence wire on that side so it hangs off the gatepost insulator.

For this type of gate, polytwine, rope, or tape is easier to handle than all-metal wire; or you can buy gate kits from fencing supply companies that come with all the appropriate connectors, handles, and manageable wire.

Fence Accessories

Many accessories are available to complete and fancy up your permanent fence. The most worthwhile to consider are:

Cut-out switches. These allow you to turn off a section of fence for repairs or maintenance without having to walk all the way back to the shed to turn off the energizer.

Connectors. These insulated pieces of wire with twists or clips on the ends allow you to hook up “hot” wires when there is a grounded wire in between. It’s also fairly simple to make your own connecting wires using insulating tubing for wire.

Tensioners. There are several types, all of them installed on the fence wire to keep it tight. These often aren’t necessary on a short fence with the posts set reasonably close; on a long fence with widely spaced posts, tensioners lessen the inevitable wire sag.

Bracing hardware. If you build corner braces with steel T-posts, invest in metal connectors, since the posts can’t be nailed together.

CHAPTER FIVE

Temporary Electric Fence

Temporary electric fence offers maximum flexibility for minimum expense and effort. Use it anywhere you need an effective fence for a short period, and especially for rotational grazing (see **chapter 7**). The many options available for polywire, step-in posts, reels, and accessories are discussed below. Choose the ones that best fit your animals, your budget, and your style of farming.

Posts and Clips

Temporary fenceposts are stuck mere inches into the ground, which is the secret of their quick and easy installation, and also explains why they aren't stable enough for long-term fences. When choosing a temporary post type, the major considerations are:

Price. Although this depends on the additional features a post might have, overall fiberglass and rebar posts tend to be the cheapest, and plastic and steel more expensive. You can also make your own posts from rebar, conduit, PVC pipe, or anything nonconductive that will hold the wire off the ground, or to which you can attach an insulator.

Step-in or pound-in. A step-in is a horizontal piece near the base of the post that allows you to push the post into the ground with your foot. Pound-in types have no step and so must be pushed in with your hand on the top of the post, or pounded in with a hammer.

Step-ins cost a little more and are a little harder to disentangle when in a pile. On the other hand, they require only one hand and a foot to install, so you don't have to drop your bundle of posts every time you stop to put one in the ground. If your soil is hard

and dry, however, the step-ins won't work, so save the money and buy pound-in types.

Built-in or add-on clips. Some posts come with clips or insulators already molded in or attached; with others you have to buy the clips separately and put them on yourself (which I find a little tedious). Clips that can be adjusted up or down are handy if you adjust wire heights often, though the molded types usually have many clips per post to choose from. If the post is non-conducting, the clips don't need to insulate and can be either plastic or metal; the metal clips are more durable. Metal posts require plastic clips.

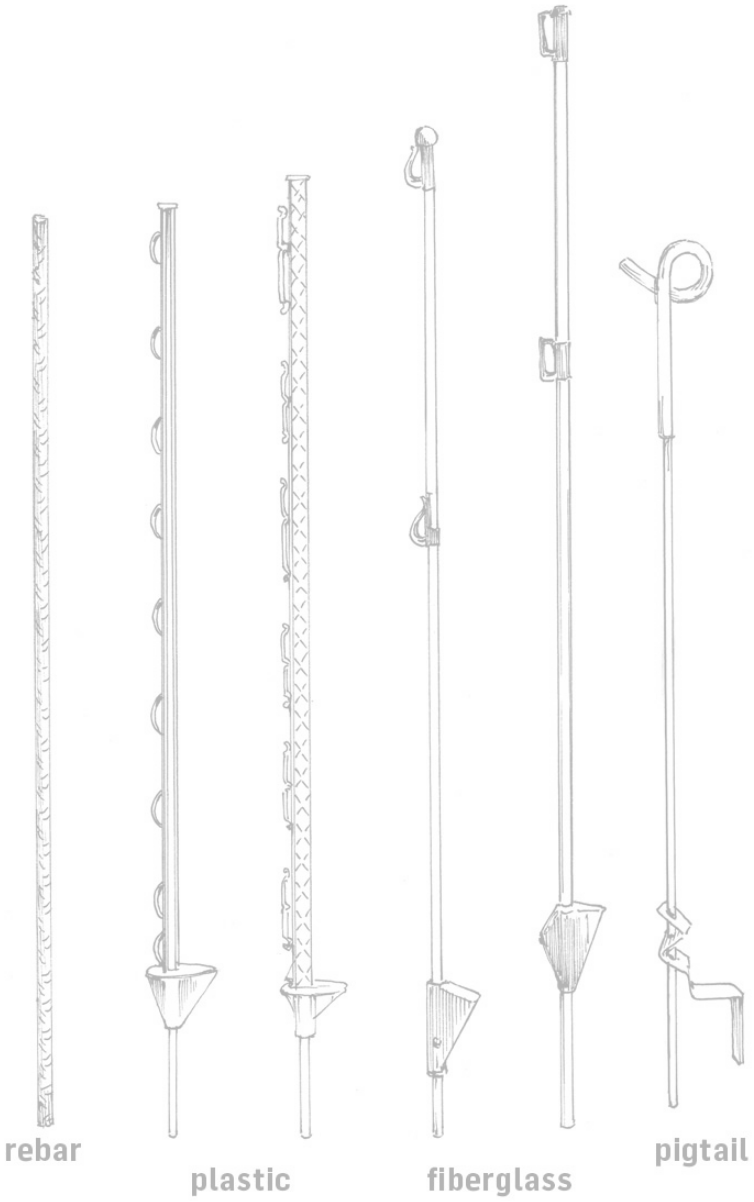
Metal or non-metal spike. The spike is the part of the post that goes into the ground. Metal spikes are more durable, but if the post is plastic and the spike is metal, there can be a tendency for the post to break at the join. The metal spike may be hard to find again, and can be a hazard to hooves and machinery. Non-metal spikes present less of a hazard when lost and don't seem to break off as often.

Durability. Although lighter to handle and easier to install, fiberglass and plastic posts will eventually weaken and break (nevertheless, I have fiberglass posts that must be 15 years old). Steel posts are more durable and can be pounded into very hard ground; other types can't — at least, not repeatedly.

Visibility. Human kids and some animals, most notoriously horses, often move without looking very closely where they're headed. In these cases the more visible the post, the better. Bulky plastic posts are the most visible.

Post Types

The four basic types of commercial temporary posts are plastic, fiberglass, steel rebar, and steel “pigtail” posts. Each has its pros and cons. I prefer coated fiberglass posts, because I set up my fences on foot, and those posts are the lightest and most compact for carrying in a bundle. A dairy-farming friend thinks I’m nuts, however; he sets up his fences from the seat of his ATV, and favors the steel pigtail posts for their durability.



ABOVE: *The four basic types of commercial temporary posts are (left to right) steel rebar, plastic (two sizes), fiberglass (two sizes), and steel pigtail.*

Fiberglass

Pros: Cheap, light, durable, takes either metal or plastic clips. Available as both step-ins and pound-ins.

Cons: Not highly visible. Old uncoated fiberglass posts must be handled with gloves to avoid tiny splinters.

Plastic

Pros: The most visible type, lightweight; clips are usually integral.

Cons: Bulky, more expensive, less durable and prone to breaking at soil level due to their metal spikes.

Steel Rebar

Pros: Cheap, durable, poundable.

Cons: Heavy, not very visible.

Steel "Pigtail"

So-called because the top of the post has a curl (to hold the wire), which looks like a pig's tail.

Pros: Very durable, tolerates pounding well.

Cons: More expensive, heavy. If the plastic coating on the pigtail cracks, the wire can make contact with the metal and short out the fence.

Homemade Posts

Pros: Cheap. One example is narrow-diameter stiff plastic pipe. Drill small holes through the pipe and use cotter pins for clips.

Cons: Depends on the post!

Wire

Wire for temporary fence, generically known as **polywire**, is made of plastic with embedded metal filaments to carry the current. This makes it very light and flexible, so it's easy to reel up and carry to the next spot you wish to fence. On the other hand, the thin filaments are a little delicate, so polywire is not as durable as all-metal wire. But if you buy good-quality wire, you don't reel it up when wet, and you handle it gently when popping it in and out of insulators, it should last many years.

Wire Types

There are four basic types of temporary wire: twine, rope, tape, and electric netting.

Twine is the smallest in diameter and thus the lightest. You can put more of it on a reel than any other type. It is the cheapest option, and also the least visible. Twine can be cut to length with scissors and knotted when it breaks. Of course, each knot makes it harder for the energizer to push a charge through; you can either buy special connectors or get a bigger energizer. I have a big energizer and make many knots.

Rope is thicker, more visible, and more expensive, and less fits on a reel. Although not as visible as tape, it's also less prone to damage from wind and ice. It doesn't knot well; get connectors if you need

to join sections. As an effective compromise between expense, durability, and visibility, I use rope as the top wire on a three-strand permanent all-electric fence, and steel wire for the bottom two wires.

Tape is the most visible, least durable, and most expensive of the three types of polywire. It's prone to damage from wind and ice, but ideal for horses and other situations where maximum visibility is wanted. Get connectors to join sections.

Electric net fencing (such as Electronet) makes the most effective fence in any situation, but also the most expensive. It's bulky, easy to tangle, and harder to handle, but for small areas with high animal pressure, you can't beat it. It's especially effective for sheep, goats, and poultry, with the right mesh size.

Quality and Color

In 1990 David W. Pratt, a Farm Advisor for the University of Central California Extension, published the results of his field trials of temporary fencing materials. He found the following:

Filament type. Aluminum filaments are much more conductive than steel and do not rust, but they have very little stretch and break easily. Steel will rust anywhere the wire collects water (often at insulators and splices), but is more durable and easier to handle.

Number of filaments. Different brands of polywire come with different numbers of metal filaments. Three are too few to be an effective conductor of electricity, while nine filaments make a bulkier wire and are more than needed. Six-filament polywire is ideal.

Color. White is hands down the most visible color against both green and brown vegetation. (Since we have snow on the ground for several months each year, I use white and black polywire for best visibility in all seasons.)

Making a Gate

Materials

Wire cutters

Handle — bought or homemade (all you need is a metal core with a nonconductive shell)

PVC pipe — a couple of feet (about 0.6 m) longer than the height of your tallest animals

Post-hole digger or sledge hammer

A 1-foot (0.3 m) length of rebar or a steel post

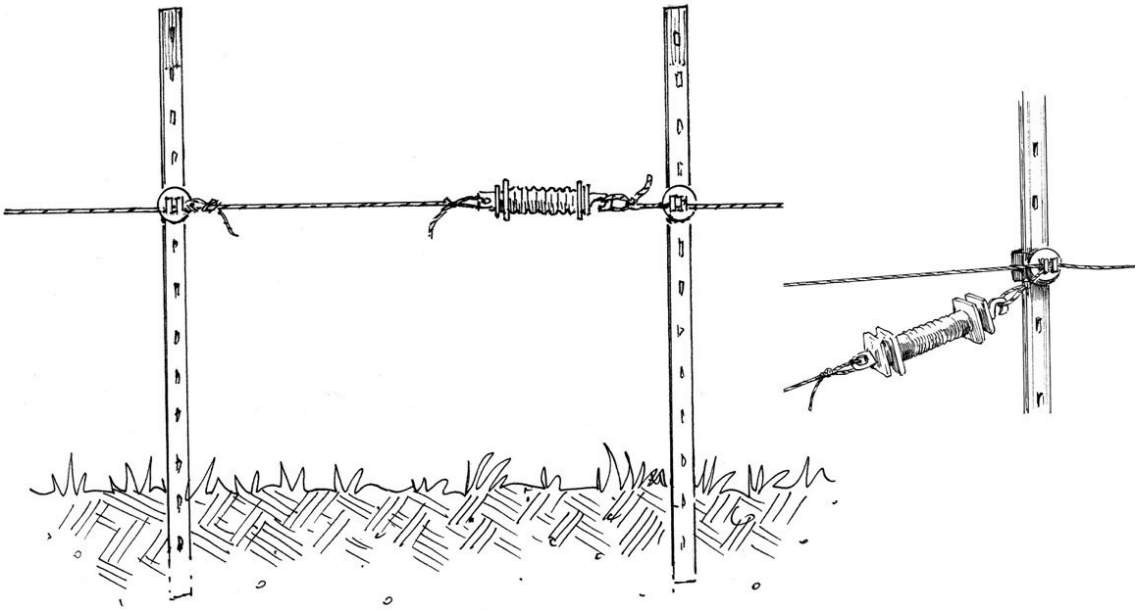
Option 1

To make a gate on a temporary fence, you will need wire cutters and a store-bought or homemade handle (all you need is a metal core with a nonconductive shell).

1. Cut the wire at the post where you want the gate to open.

2. Tie on the handle. Tie a loop in the cut wire end at the post and knot it onto the insulator.

3. Hang the gate handle on the loop and you have a closed gate.



ABOVE: *To make a temporary gate with polywire, cut the wire, tie a handle on one end, make a loop on the other, and you have a gate.*

Option 2

If you plan to change your paddock configurations often, you may not want to keep cutting your polywire for new fence lengths and gate locations. You can get by with no gates at all if you have only one or two wires on the fence.

1. Take a piece of PVC pipe a couple of feet (0.6 m) longer than the height of your tallest animals. Cut notches in the top to hold the wire.
2. Decide where you want animals to move through the fence, and pound an anchor into the ground — a piece of rebar, a steel post, or whatever — that will hold the pipe steady.
3. Catch the fence wire(s) in the pipe notches, raise that end up, and put the bottom end over the anchor. The livestock will quickly learn to walk underneath.

Option 3

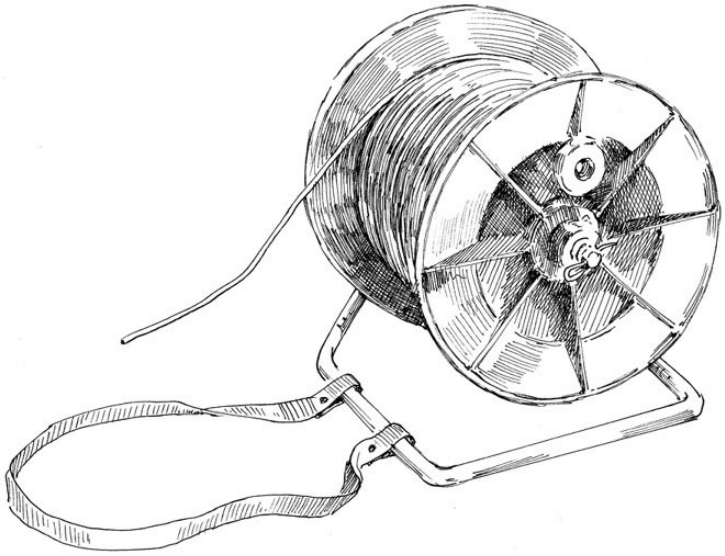
If you're using electric net fencing to make a gate, just turn off the fence, pick up the end post, and walk backwards, opening that section to let the animals through.

Reels

If you use any form of polywire or tape, a reel is essential for quick, non-tangled setup and take-down of your temporary fences. You can make your own reels out of any reasonably small, light spools left over from other projects. All you need is an axle through the middle (so you can grab one end to let the reel spin) and a handle on the rim (to make the reel wind).

If you put up your fences on foot and decide to buy a reel, look for the lightest weight combined with good durability. This usually means plastic parts held together by metal screws and bolts. A handle is essential but doesn't have to be bulky, and a strap is handy for hanging the reel around your neck when you need both hands free.

On the other hand, if you put up your temporary fence up from an ATV, you may prefer a heavier reel with more metal parts that will better tolerate the higher strains.



ABOVE: *You will need to buy or make a reel to help set up your electric fence without tangles and other traumas.*

A stand or hanger is helpful on any reel, so the reel can be set on the ground or hung on a post without shorting out the wire, and a brake will hold the wire taut.

Making Corners and Ends

Making Corners and Ends

All good temporary fences come to ends, and when they do there is enough strain even with light polywire to require a little added bracing. The usual options are:

Put in steel T-posts at your corners and gates. A single post takes only minutes to install and can handle the strain of several polywires, allowing you to pull the wires pretty tight. A T-post is also reliable throughout the season. On the other hand, if you're changing paddock sizes often, you may not want to be pounding and pulling T-posts all the time.

Make "cells" with permanent fence that can be cross-fenced with temporary fence. The runs of temporary fence won't have corners; you can just hook the ends onto an electric wire on the permanent fence with its sturdy permanent posts.

Brace temporary posts at corners and ends with extra posts or a stake and rope.

A Final Note

Since there are so many choices for temporary electric fenceposts, wires, and accessories, and since personal preference plays a big part in finding a fence that works for you, don't be shy about trying a few different things in order to find some favorites. Buy only as much as you need right away and try it out, so when you set out to enlarge and refine your system you'll have a better idea of what works and what you like.

CHAPTER SIX

Planning and Building Your Fence

By now you should have a good idea of what sort of fence(s) you'll be building and which components you want to try. Next take a thorough look at whatever fencing you already have and decide whether it's usable as is or can have its life extended with some offset electric wires. Or maybe it's time to take it down and start over.

Next you'll need to draw a plan, compile a shopping list, buy enough tools and materials to begin, and start building fence.

The Plan

Using your own sketch or an aerial photo of your land, pencil in where you plan to put your fences, especially noting where you'll place any permanent corners or gates. (For more on placement of temporary fences, corners, and gates, see **chapter 7**, Rotational Grazing.) Anywhere the fence turns you will need a corner, and every fenced area will need at least one gate.

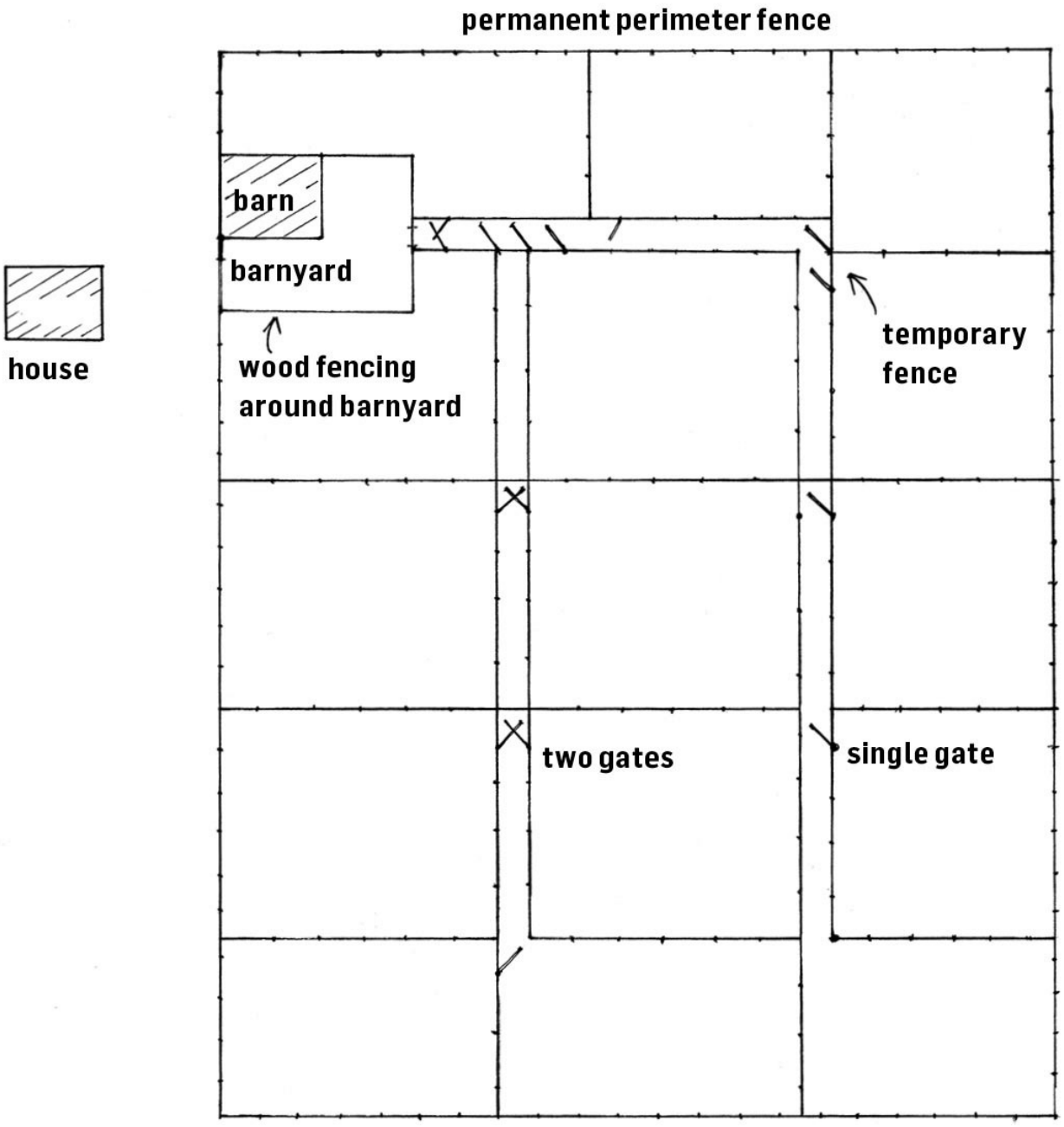
Energizer. The energizer should be installed as close to the fence as possible, to minimize the length of the run-out wire (since this typically needs to be buried or run overhead). A plug-in energizer must be protected from the weather, so hang it in a shed or barn that has electric power, but as far as possible from water lines and utility grounds (a 50-foot minimum is often recommended). Battery- and solar-powered energizers should be set up next to the fence, following the manufacturer's directions.

Corners. Set corners so the fenceline between them is straight; that will keep your line posts from gradually leaning over.

Mower clearance. If you're an organic farmer and you don't use spray to keep vegetation off your fence wires, leave enough room on both sides of the fenceline to get a mower through.

Gates. Gates should usually be placed in the corner nearest to the farm buildings, since this saves extra walking or driving and makes moving livestock in and out much easier. Put them on firm level ground that is high and dry, not low where water will collect and create mudholes when traffic is heavy.

Lanes. If livestock will have to move past near pastures to get to farther ones, you will need a lane as well. Lanes can be temporary or permanent. Permanent lanes should be wide enough to move your equipment along; 16 feet (4.9 m) is usually adequate unless you have a really big vehicle, though you will need more width where there are curves or corners.



ABOVE: *Before buying materials or building a fence, sketch a diagram showing where corners, fencelines, gates, lanes, and the energizer will be placed.*

The Shopping List

Your list should include an energizer, ground rods and clamps, run-out wire, lightning and surge protectors, and a fence tester, plus all the fence materials and tools.

To calculate how much fencing you'll need, measure the length of the proposed fencelines. This is best done by taking a walk; you can count paces, use a tape measure, or run a measuring wheel to get the total length.

Count the number of corners and gates as well, and decide how wide you'll make the gates. For animal and ATV use only, 10 feet (3 m) is enough room; for tractors and trucks, 16 feet (4.9 m) is comfortable for all but the biggest vehicles.

Also decide how far apart you will set your posts, and whether and what kind of bracing you'll use on the corners. If you're uncertain on post spacing, look at your neighbors' fences or attend some farm field days to get opinions — and then don't worry too much. Post spacings vary a lot according to locale and wire type, and most of the variations work.

Next do the math and make the shopping list.

Wire. Multiply the length of the fence times the number of wires to get the number of feet (or meters) of wire, polywire, or netting needed. Be a little generous in your calculations.

Posts. Divide the total fence length by the post spacing to get the number of posts to buy. Don't forget; you'll need extra posts for gates and corner braces (if any).

Insulators. Multiply the number of posts by the number of wires to get the number of insulators or clips you'll need, unless you're using electric net fencing or all temporary posts with clips already attached.

Gates. Count how many handles or permanent gates you'll need to buy or build.

Accessories. Add a reel or two for temporary fence wire, cut-out switches, connectors for any T-post corner braces, and smooth wire for corner braces.

FIGURING OUT WHAT YOU NEED

Permanent corner posts (steel, wood, or other):
How many? _____

Brace posts: (steel, wood, or other): How many? _____

Brace hardware (steel and plastic posts only):
How many? _____

Permanent line posts: (wood, steel, other): How many? _____
(divide the length of the fence by the post spacing)

Temporary posts: (fiberglass, plastic, steel, other):
How many? _____
(divide the maximum anticipated length of fence in use at one time by the post spacing)

Insulators: How many? Corner and end insulators _____
Nail-on for wood line posts _____ Snap-on for steel line posts _____ clips for temporary posts _____
(multiply number of posts x number of wires to get total number of insulators)

Permanent electric wire: How many feet? _____
(length of fence × number of wires)

Temporary wire: How many feet? Electric net fencing _____
Twine _____ Rope _____ Tape _____
(maximum length of fence in use at one time x number of wires)

Reel(s) for polywire: How many? _____ (start with one)

Energizer type and size (plug-in, solar, battery; total joules)
_____ (always buy a bigger energizer than is indicated by the length of fence, to compensate for dry conditions, heavy vegetation loads on fence wire, wire in less than pristine condition, and other constraints on the voltage load)

Insulated run-out wire: How many feet? _____
(enough to get from energizer to fence, and from energizer to ground rods; extra can be handy for burying lines across gates)

Ground rods and clamps: Length, type, and number _____
(all should be of the same type of metal)

Gates: Number, size, and type _____

Gate handles _____

☐ Fence tester ☐ Lightning protector ☐ Surge protector

Other accessories _____

Tools: Post-hole digger or power auger, post pounder, post puller, fencing pliers, etc. _____

ABOVE: *Figuring Out What You Need worksheet. Download a printable PDF* **here**.

Building the Fence

An electric fence, whether permanent or temporary, goes together in 11 basic steps.

1. **Install the energizer.** If it's a plug-in type, hang it up next to an outlet inside a building or weather-proof shelter near the fence-to-be. Solar and battery-powered energizers are hung on a post or set on the ground on the opposite side of the fence from the livestock.

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2. **Install the ground rods.** These should be the appropriate number, length, diameter, and spacing for the size of the energizer and length of the fence (see **chapter 2**). Pound the rod(s) in until there are just a few inches showing above the ground, with the first in line within 20 feet (6.1 m) of the energizer (solar- and battery-powered energizers are placed right next to the ground rod, or may have an integrated rod). Put a clamp on the top of each rod.

   Starting at the far end of the line of rods, run a wire down the row of rods and clamp it so there is direct wire-to-rod contact on each rod (use insulated run-out wire, stripping a couple inches of insulation off where the wire is clamped to the rod). At the near end, run the

wire up to the energizer and attach the end to the negative terminal.

3. **Set up the energizer-to-fence connection.** Connect one end of an insulated run-out wire to the positive terminal on the energizer, and then run it out to the fence. With a plug-in energizer this will probably be a few to several feet, so bury the wire or put it up high. Don't leave it on the ground surface where it could be hit by a mower, or at human height where you could walk into it when you're thinking about something else.

4. **Install corner and gate posts and any braces.** For a permanent fence, put in the corner posts and then stretch baling twine, fence wire, or polywire reasonably tight between each of the two posts. Then put in the brace posts (if any) and line posts exactly on the line of twine. (For how to put together a brace, see the illustrations in chapter 4, **page 46**.)

5. **Put in the line posts.** Posts are much easier to pound, push, or dig in when the ground is moist and soft in the early spring, so, if at all possible, plan your fencing projects for that season. For permanent fence, use a tape measure or measured length of wood or PVC pipe to get precise post spacing along the taut line of twine stretched between the corners.

   For temporary posts, pacing off the distance between them is exact enough, and you can certainly put the line posts in before you stretch the polywire. Do whichever works best for the particular situation.

6. **Install the appropriate number and type of insulators on each post** if they aren't already attached. (With temporary posts this might be easier to do before you put them in the ground; with permanent posts it's better to put in the posts first and attach the insulators after.)

7. **String the wire.** Secure the end of the wire or polywire at a corner or end, thread it through the insulators or clips on the line posts, pull it tight, and secure the far end. Grounded wires don't need to be run through insulators, but it may be just as easy to use insulators as to find clips for T-posts or use fencing nails on wooden posts. If grounded wires are insulated, they will need to be attached to a ground rod placed along the fenceline. Do **not** attach grounded fence wires directly to the energizer's ground rods or the energizer itself.

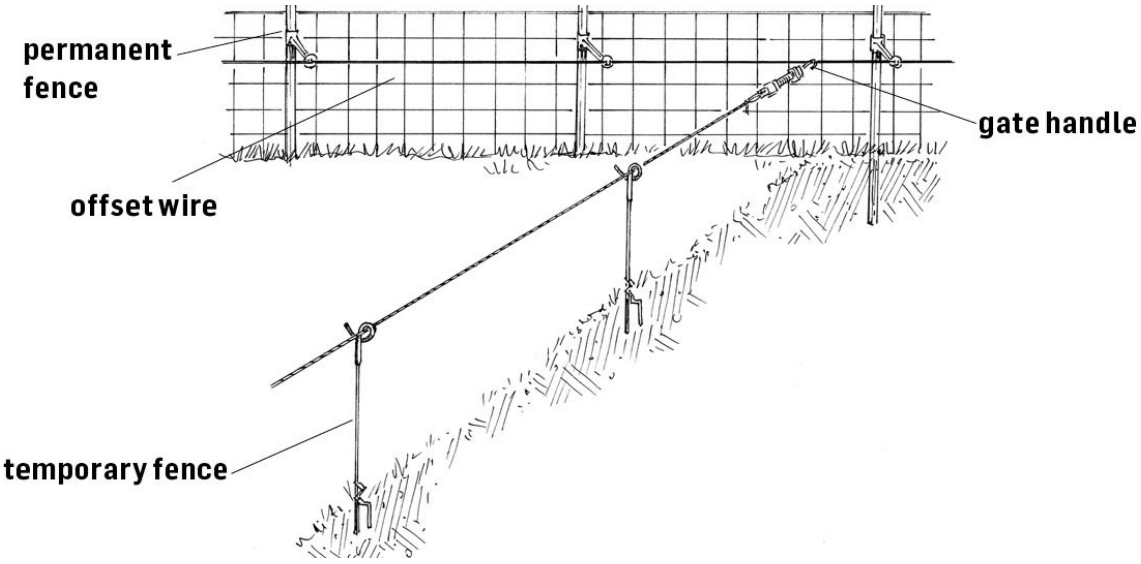
8. **Install gates.** If you're putting in a nonelectric gate but need to get the current from one side to the other, bury a length of insulated wire under the gate or run it overhead.

9. **To connect the energizer to the fence, install a lightning protector** according to the directions on the package between the run-out wire and the fence wire to protect the energizer from getting fried by a lightning bolt hitting the fence.

10. **Plug in the surge protector** if you have a plug-in energizer, then plug the energizer into the protector.

11. **Plug in or turn on the energizer, and test the fence.** Following the "how-to" directions on the package, use

your fence tester to make sure there is enough voltage on the fence all the way to the end. If there is, you're done! If there isn't, see **chapter 8**, on troubleshooting and repair.



ABOVE: *Temporary fences can be powered by hooking them to permanent electric fences.*

Four Mistakes to Avoid

Here are some tips on what *not* to do when building an electric fence.

A grounded wire on the bottom makes it pain-free for an animal to crawl under your fence; a grounded wire on the top won't stop a jumper. Always have live wires on the bottom and top of your electric fence, and grounded wires in between.

Do not skip the ground rods, instead just wiring the energizer's ground terminal to a metal fencepost, or anything else metal that sticks up out of the ground. This can attract lightning, and then the charge goes directly to the energizer and fries it.

Don't wire the energizer's ground/earth terminal to a water tank, water pipe, barn, shed or anything else that could carry a charge to livestock when you don't want them to get shocked.

Don't install the energizer and ground rods any closer than 50 feet (15.2 m) (and farther away is better) from the farm's utility wires or utility ground system. This can attract stray voltage and interfere with phone and Internet service.

Variations for Rotational Grazing

Building paddocks for rotational grazing with temporary fence can be done in three basic ways:

Set up all the paddocks at the start of the grazing season. This is when the ground is usually softest, which reduces the work whether you're putting in permanent or temporary posts. Finishing the fencing before the summer rush of farm work also means you're not moving fences when you should be making hay.

Put up and take down paddocks as you go. This takes more time through the season, but allows maximum flexibility in paddock sizing so you can really fine-tune the rotation to the rate of grass growth.

Strip graze. This method is used to closely ration the food supply, which can prevent digestive upsets caused by too much of a too-rich forage, keep equines from getting overly fat, or prevent livestock from trampling and wasting significant amounts of a limited supply. Move a temporary fence daily to open up a new narrow strip of the field or pasture. If it's during the growing season, a back fence is often used to allow grazed areas to regrow.

CHAPTER SEVEN

Rotational Grazing

Rotational grazing and electric fence go together like popcorn and butter. You can have one without the other, but why would you want to work so hard? If you keep livestock or poultry, and plan to farm using sustainable principles, then you will be rotationally grazing. And you will have contented animals.

How It's Done

Rotational grazing is so-called because livestock are rotated through many small pastures, or paddocks, during the growing season. The long rest between grazings produces more and better-quality forage for your animals, as well as more root growth to support the increased leaf and stem growth. More roots and manure mean there is more organic matter being added to the soil, improving its moisture-holding ability and furnishing critical nutrients.

In traditional, low-intensity grazing, you turn out a bunch of livestock into a big pasture for the whole growing season. By the end of the summer they've chewed everything they like down to the dirt and you're feeding hay because there's no grass left. This also eliminates all competition for the weeds, which then become tall, strong, and abundant.

Divide It Up

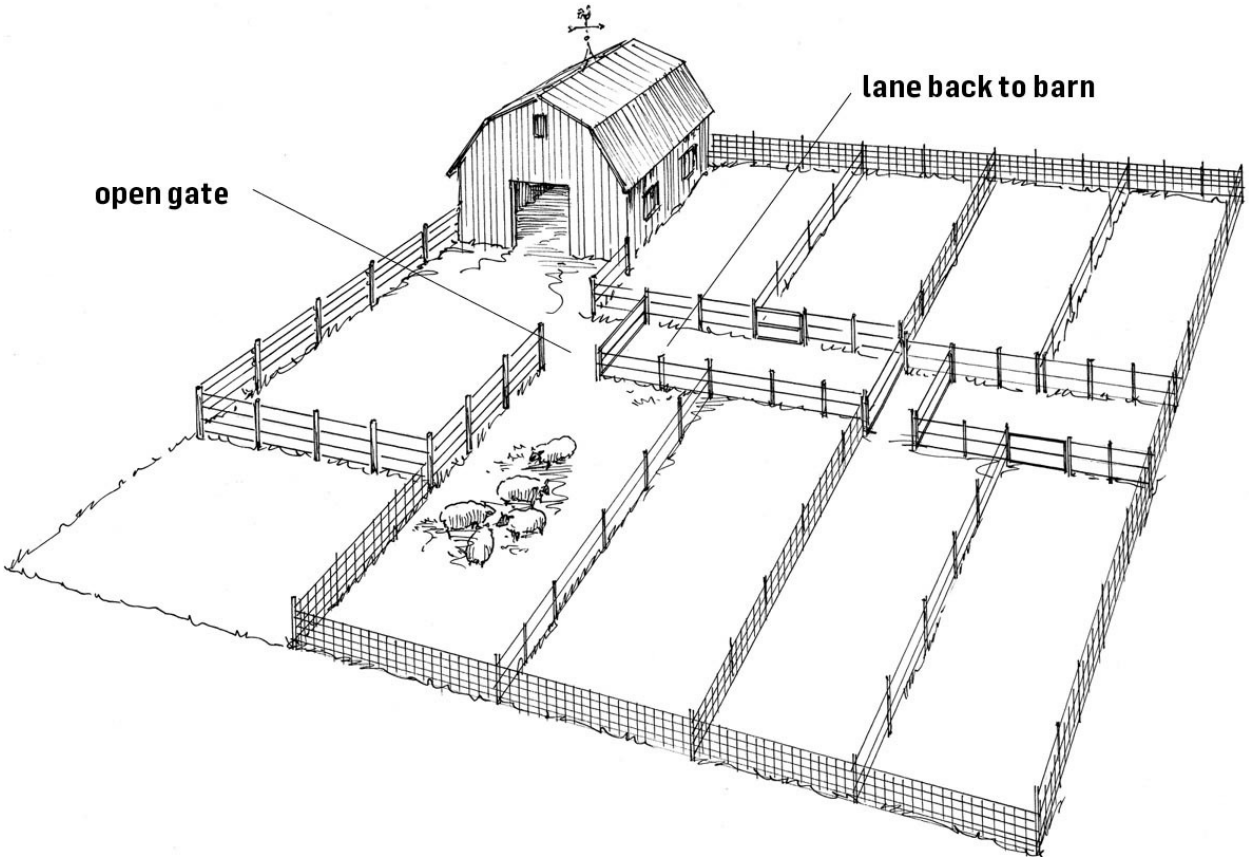
In rotational grazing, the big pasture is subdivided into a bunch of little ones using temporary electric fence. A relatively large number of livestock are put in a small paddock for a short time period, anywhere from twelve hours to five days. Because there are so many animals in such a small area they learn not to be too

choosy about their food, and the grazing is much more even and thorough (although they will still leave the thistles and other really nasty plants).

When the grass in that paddock is gone, move the livestock to the next one, and then the next one after that, and so on, until they've made the complete circuit. The animals don't come back to that first paddock until the grass and clover have had time to regrow tall and luxuriant, which may take anywhere from 10 days to several months, depending on the general climate and particular season. The plants aren't regrazed every time they show a little new growth; they have time to rebuild both roots and leaves.

Rest periods are the critical factor in successful rotational grazing. If you don't give the plants enough time to regrow, the system begins to fail. If you give the plants too much time, they become less palatable and aren't grazed as well.

Since the rate of grass and legume growth varies with season, temperature, and moisture, the rate at which livestock are moved through paddocks, and/or paddock size, needs to vary as well.



ABOVE: *A paddock system for rotationalgrazing should be set up for ease of movement of animals. In this system, where the livestock come back to the barnyard for water, the gates and lane are designed to allow free movement back and forth from whichever paddock they're in.*

Rotation Rules of Thumb

In the spring when pasture growth is at its peak, the rotation should move quickly, to keep the grass from, as they say, "getting ahead of the livestock." This is done in two ways (you can use one or the other or both at once, depending on your situation):

1. Don't worry about grazing the grass down; just get the tops taken off to hold it back from maturing too fast. Instead of leaving the herd in a paddock for three days as you might later in the summer, put them in for just a day.
2. Take half or so of the paddocks out of the rotation, let them mature, and make hay.

In dry periods or in the heat of summer, when grass growth slows or stops, slow down the rotation by subdividing paddocks and/or adding paddocks from where you'd cut first crop hay (first read the section on **bloat** below).

At the end of the season, when grass quits growing, you will have many paddocks that grew back but were not grazed before growth stopped. This is now standing hay that will extend your grazing season for weeks — maybe even months. That's a lot of hay you won't have to bale, store, and feed out.

Bloat

Cattle that are suddenly turned on to lush alfalfa or clover pastures may bloat and die within hours. Bloat results when fine vegetation forms a mat on top of the liquid contents of the rumen, blocking the esophagus so the animal can't belch the gas that is the natural byproduct of digestion. Legumes (alfalfa and clover), because of their structure and fineness, are prone to form mats in the rumen. This causes the rumen to swell up so large that it prevents the animal from breathing, and so it dies.

There are several methods for decreasing the possibility of bloat. The first would be not to turn livestock on to pure alfalfa or clover pastures; more than half of the vegetation should be grass. If

you are in a dry period where alfalfa is the only thing that's still green and you don't have much choice, try the following:

Feed them hay. Give the animals a good feed of hay in the morning, then turn them out in the afternoon. Keep hay available in the paddock at all times. This dilutes the alfalfa and helps prevent it from forming the fatal mat.

Transition to legumes gradually. If possible, make the transition to the legume-rich diet gradual, to give rumen bacteria time to adapt to the new diet. Start with an hour a day and build from there over the course of five to seven days. The rest of the time, keep the animals in a grassy paddock or feed them hay.

Be vigilant. Keep a close eye on the livestock for the first several days, so if bloat does occur you can catch it early and get immediate veterinary advice and assistance.

Watch the weather. If the forecast calls for a hard frost overnight, take the animals off the alfalfa and wait three days. For some reason frozen alfalfa causes bloat even more readily.

Setting Up a System

The number and size of your grazing paddocks will depend on all of these elements:

- How many animals you'll be grazing
- The species, age, and intended use of your livestock
- Your climate

- The size of your property
- The quality of your pasture

To help you find out more about rotational grazing, some resources are listed at the back of this book to get you started. Be sure also to contact your Agricultural Extension agent and any grazing networks you can find in your area. The farmers who are grazing the same type of livestock in your area will give you the best specific information.

Although the principles of rotational grazing are simple, adapting them to your farm operation will be a lifelong study. Fortunately, rotational grazing is a forgiving and resilient system, which will work well from the start and only improve as you continue to refine it.

Drawing up a Plan

Draw your plan on paper first, since with multiple paddocks it's so easy to get the gates wrong and use a lot more fence and posts than you really need if you're building on the fly.

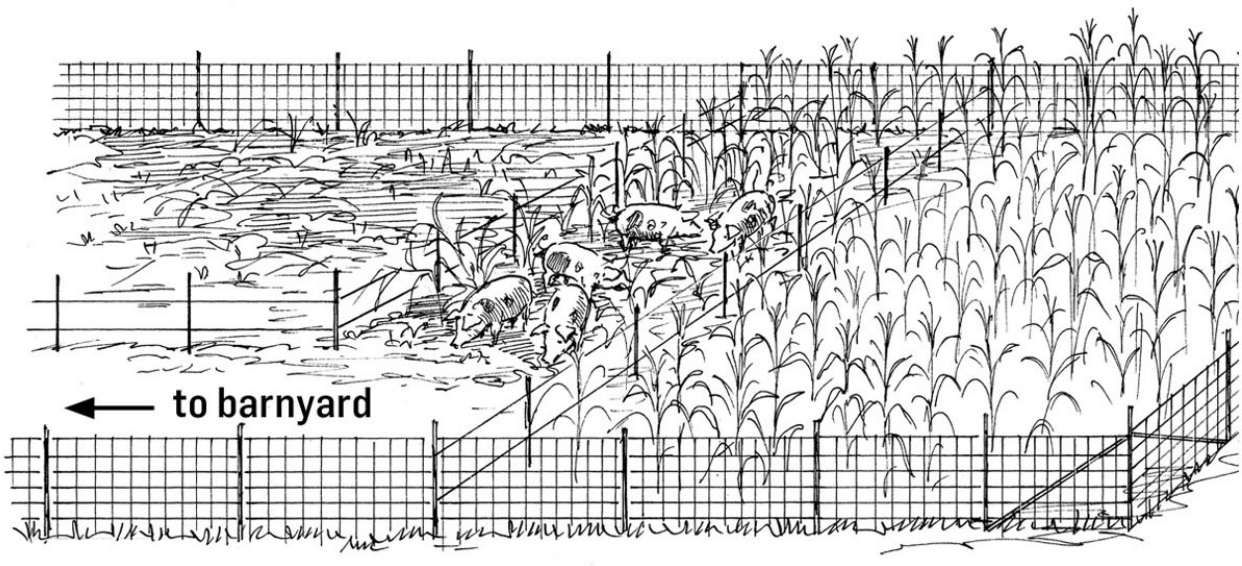
You can start with four to a dozen or more paddocks, depending on whether you want to just dip your toe in or go all out.

In most cases, you'll want to create a lane as well, which will connect paddocks just as a long hallway connects rooms in a building. The lane allows easy movement of animals to and from the barn and/or pens and handling facilities. If you put the water tank near or in the barnyard or holding pen, your livestock will become comfortable with being there, which makes vaccinating and sorting days much calmer.

A paddock gate should swing open across the lane to close off the rest of the lane (see illustration on **page 77**). This allows the

animals free access to go back and forth between paddock and barnyard.

As alternatives to lanes, move front and back fences to change paddocks. Another possibility is strip grazing, where you move a front fence just a few feet every day or two to ration out a pasture or cornfield. I've used this very successfully with donkeys, which founder easily on too rich a diet. Strip grazing them allows me to give them just enough grass each day.



ABOVE: *Strip grazing is an excellent method to ration out a pasture or field, ensuring that very little is wasted.*

Size, Shape, and Location of Paddocks

As you put your plan together, incorporate these general rules:

Put your fences along natural breaks in the terrain, if practical. If you have a flat property, this isn't a consideration; otherwise, if at all possible (and it isn't always possible), put the fences where the

slope reaches bottom, or where the hilltop begins to drop off. This results in more even grazing.

Make paddocks as close to square as you can, where possible, since the livestock will graze them more evenly.

Plan for smaller paddocks and more frequent moves for livestock currently being milked or when rapid weight gain is the goal. Smaller paddocks mean more forage will be consumed at its optimal nutritional level, and less forage will be lost to trampling and manuring. If you are trying to maintain weight (as with dry beef cows and equines) rather than increase it (as with young stock) you might be better off with larger paddocks and a slower rotation, so the diet is not so rich.

Keep livestock out of woods and water. Unless you are "flash"-grazing woods to control underbrush, livestock will damage tree roots by compacting soil, and can damage bark and branches. On ponds and creeks animals will break down banks and foul the water. If you intend to use a pond or creek as a water source, construct a small contained entry with a firm surface and fence off the rest.

When in doubt, start with temporary fence. Try different paddock configurations through a grazing season or two to find out what works best. Then put in any permanent fencing you might want.

CHAPTER EIGHT

Maintenance, Troubleshooting & Repairs

Although they are cheaper and quicker to build than nonelectric fences, electric fences require more maintenance and repair than traditional types. On the other hand, most electric fence repairs are simple. There isn't a lot of tension on the wire, so broken wires or polywires can be quickly knotted or clipped back together, and bad insulators are easily changed.

The first step in maintaining an effective electric fence and finding small problems before they get bigger is to walk or ride your fencelines routinely, looking for downed or broken wires and listening for the snapping sound that indicates a short. Some people do this daily; I find that once or twice a week is (usually) adequate on our farm since I have a secure perimeter fence. But I always check the fence the morning after a wind or lightning storm.

Routine Maintenance

Keep your fence wires clear of vegetation. This is the most important step for keeping your fence operating at peak power and getting the maximum lifespan out of it. Certainly this isn't always possible, especially in the spring when the grass is exploding and there are a million other things needing to be done. A good-quality, oversized, low-impedance energizer will power through a lot of vegetation until you have time to clear your fencelines.

We brush-mow both sides of our permanent fencelines once every month to six weeks during the growing season. If you are not opposed to chemical use, you can spray your fencelines with a broad-spectrum herbicide to keep them free of vegetation.

Besides routine checks and mowing, take a close look once a year at all parts of your fences, both permanent and temporary

(spring is a good time, before livestock are turned out):

Check ground rods for rust and corrosion. Mild corrosion can be wire brushed off rods, clamps, and wire. If there is severe corrosion, replace the ground rods.

Examine run-out wires for cracked insulation. Where they are buried, check the exposed tips for signs of brittleness or rusting. Replace if the wire is starting to deteriorate.

If you have used an insulating sleeve to get an electric wire across nonelectric wires, metal posts, or a gate, check the wire inside the sleeve for rust and replace it if necessary. Sleeves are handy, but they tend to curve down in the middle and accumulate rain water and dew, which rusts the wire.

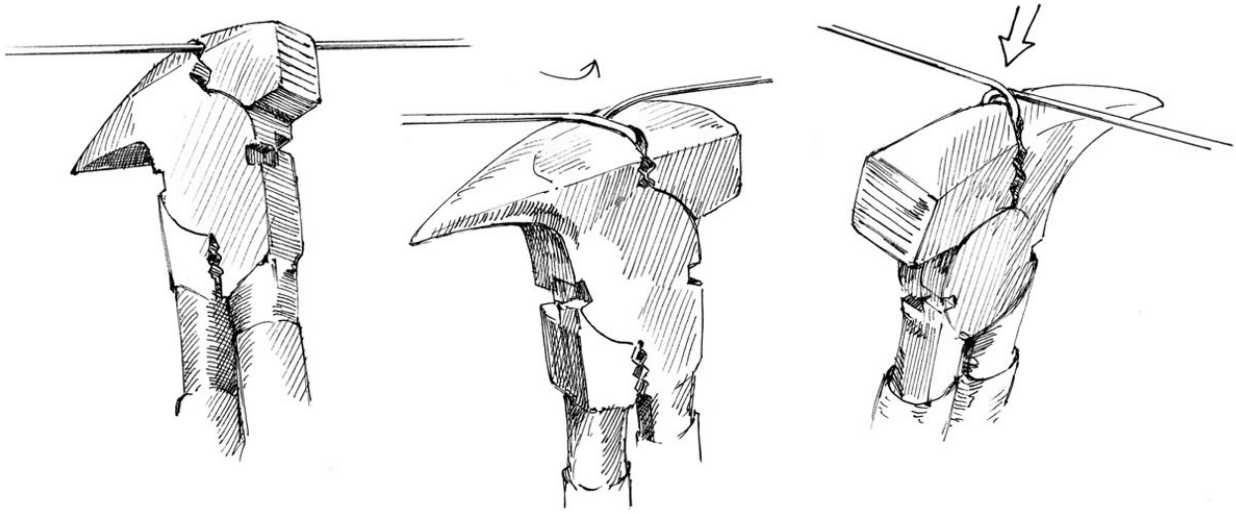
Check plastic insulators on permanent fence for bending, cracking, or other signs of imminent failure. Replace as needed.

Tighten wires using a fencing pliers or special tightener to put a crimp in the wire or twist off a loop. Permanent fence wires will stretch over time, which can allow an electric wire to sag into a grounded wire and short out the fence.

Check corner and gate braces to make sure they're still square and tight, and the stick used to tighten the brace wire hasn't fallen out or started to bend or crack.

Examine the temporary posts every year for signs of wear and tear, such as splintering fiberglass, cracking plastic, broken clips and step-ins, and worn-through plastic coating on the pigtail posts. Replace bad posts, or at least use the questionable posts in low-stress locations.

Replace bad sections of polywire with fresh wire. Polywire is very durable if you buy good quality and handle it gently. Eventually, though, the metal filaments will break due to weathering, rust, or trauma. Invisible shorts from broken filaments can be located with the fence tester. Polytwines can simply be knotted together, but to get a good connection with rope or tape may require buying special connectors or making your own. I've had good luck knotting together tape ends, then wrapping a short metal wire tightly around the tape and across the knot.



ABOVE: *A quick method of tightening a slack wire is to twist a loop in the wire with fencing pliers. Note: This bending weakens the wire, so a future break will be more likely to occur at this point.*

Troubleshooting

When there's no charge on the wire, the problem is either the energizer, the fence wires, or issues with the grounding system

due to dry weather, frozen soil, or not enough ground rods.

Learn to discover shorts before your livestock do by picking up on little clues like the strength of the clicking noise made by the energizer, or not hearing any faint snapping where wire is spliced or knotted together along the fenceline.

If you're still suspicious, without any obvious clues, that there's a short or that dry weather has also dried up the charge on the fence, get out the tester and check the wire. If there is a problem, the next step is to locate the source.

How to Check for Shorts

Start with a quick visual check of the fenceline, the most common culprit. The usual suspects are a broken wire, an electric wire contacting a grounded wire, or a temporary wire and post(s) that were knocked down by an animal that made a sloppy jump.

If the problem is not immediately obvious, next check the energizer.

To test the energizer, disconnect the run-out wires. Put the fence tester's negative clip on the ground terminal, and the positive clip on the fence terminal. If the voltage reading is satisfactory, the problem is not the energizer. If the problem is the energizer, call the dealer and arrange for repair or replacement.

If the energizer is okay, check your ground rods next, making sure they are all tightly connected and there isn't a lot of corrosion.

If the ground rods are firmly and cleanly connected and a subsequent check of the fenceline shows no problems there, then the low voltage reading may be due to unusually dry or frozen

ground. Try adding more rods and/or a grounded wire on the fenceline. Some farmers water their ground rods when it gets very dry; this may help or not, since the ground where the livestock are standing will still be dry.

If both ground rods and energizer check out, take the tester to where the run-out wire joins the fence and test the end of the run-out wire. If it is shorted out (usually because the insulation has cracked on a buried wire), replace it.

If the run-out wire is okay, work your way down the fenceline, testing as you go, until you find the spot where the voltage stops or dwindles to a trickle. At this point start looking closely for cracked or broken insulators, wire ends that made contact with a metal post or grounded wire, or gate handles with so much rust on the ends that the current can't power through. Or use a fence tester that can measure amps to find where the volume is escaping.

If it's none of these, find and replace the bad section of wire.

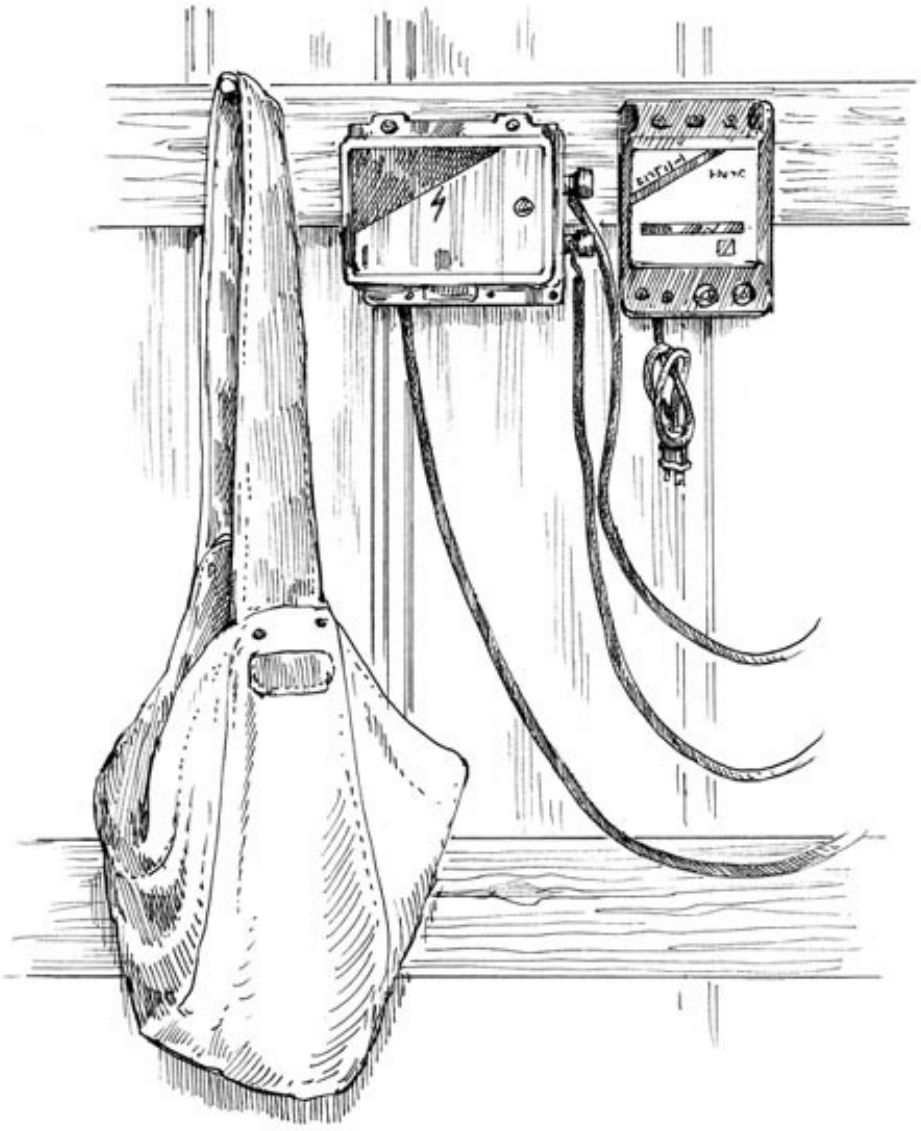
Repairs

In our machine shed, hanging near the energizer, I have an old paperboy's sack, which my husband used to carry as a kid delivering newspapers. This is my fence repair kit. It contains:

- A couple of short coiled lengths of polywire for repairing breaks or replacing sections of bad wire
- A small coil of multi-stranded steel wire for repairs on the permanent fence
- A few snap-on insulators for T-posts

- A gate handle or two
- A fencing pliers
- A scissors for cutting polywire
- The fence tester

Any time minor repairs are needed, I just grab the sack and a couple of step-in posts and I'm ready to go. Having a maintenance and repair kit appropriate to the type(s) of fences you have saves a lot of trips back to the shed for things you forgot.



ABOVE: *A five-gallon bucket or an old paperboy sack can make an excellent container for your fencing repair kit.*

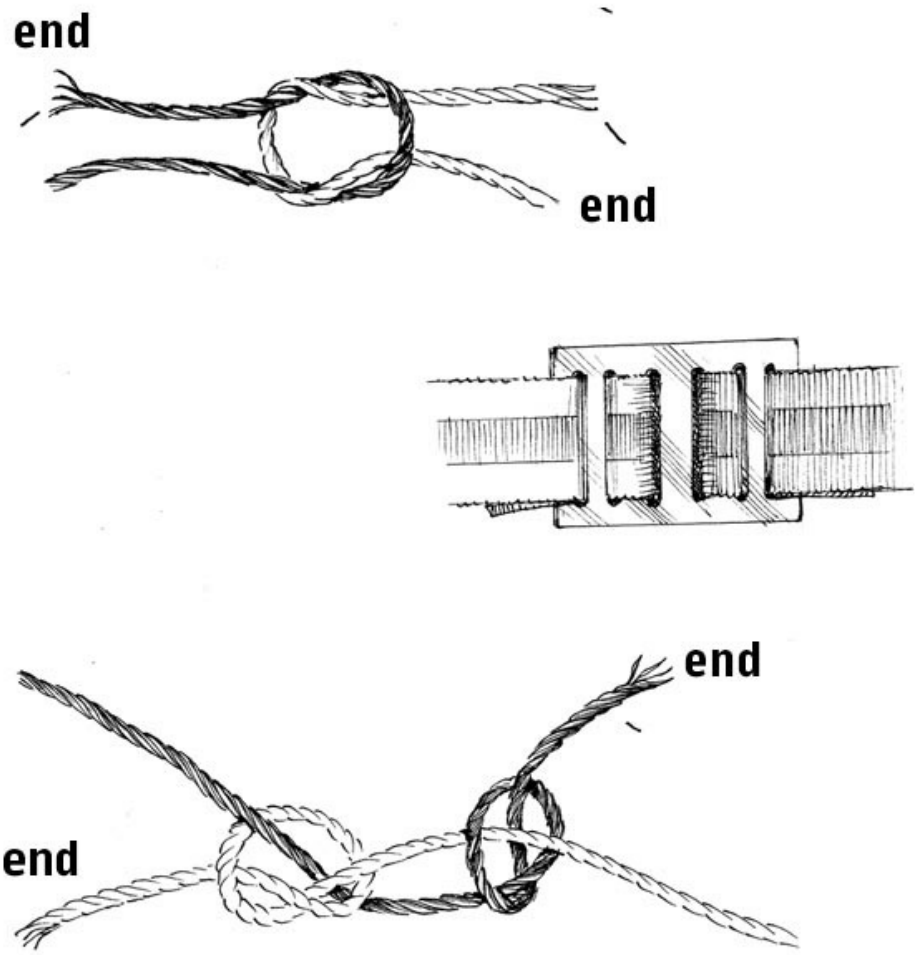
Fixing Wires

Fixing broken electric fence wires is simple. Metal wires should be twisted and/or knotted together securely. Polytwine can be

knotted. If you have poly rope or polytape, keep a few connectors on hand; these are cheap insurance, available from suppliers.

Poly netting is less subject to breakage, but more tedious to repair. Do not get charged wires mixed or connected with grounded wires or verticals.

To replace a bad section of wire, just cut it out and tie the good ends together, or splice in a new section.



ABOVE: *When splicing wire ends, the goal is to make a good electrical connection.*

Resources

Recommended Reading

Damerow, Gail. *Fences for Pasture & Garden*. Storey Publishing, 1992.

Readable, thorough, and clear. Chapters 7, 8, 9, and 10 cover energizers and electric fences, and although the technology has advanced some since then, the information is still basically excellent.

Suppliers

Gallagher Animal Management Systems

Riverside, Missouri

800-531-5908

www.gallagherusa.com

Kencove Farm Fence Supplies

Blairsville, Pennsylvania

800-536-2683

www.kencove.com

Live Wire Products

Marysville, California

800-272-9045

www.livewireproducts.com

Parker-McCrory Mfg. Co.

Kansas City, Missouri

800-662-1038

http://parmakusa.com

PowerFlex Fence

Seymour, Missouri

888-821-4925

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